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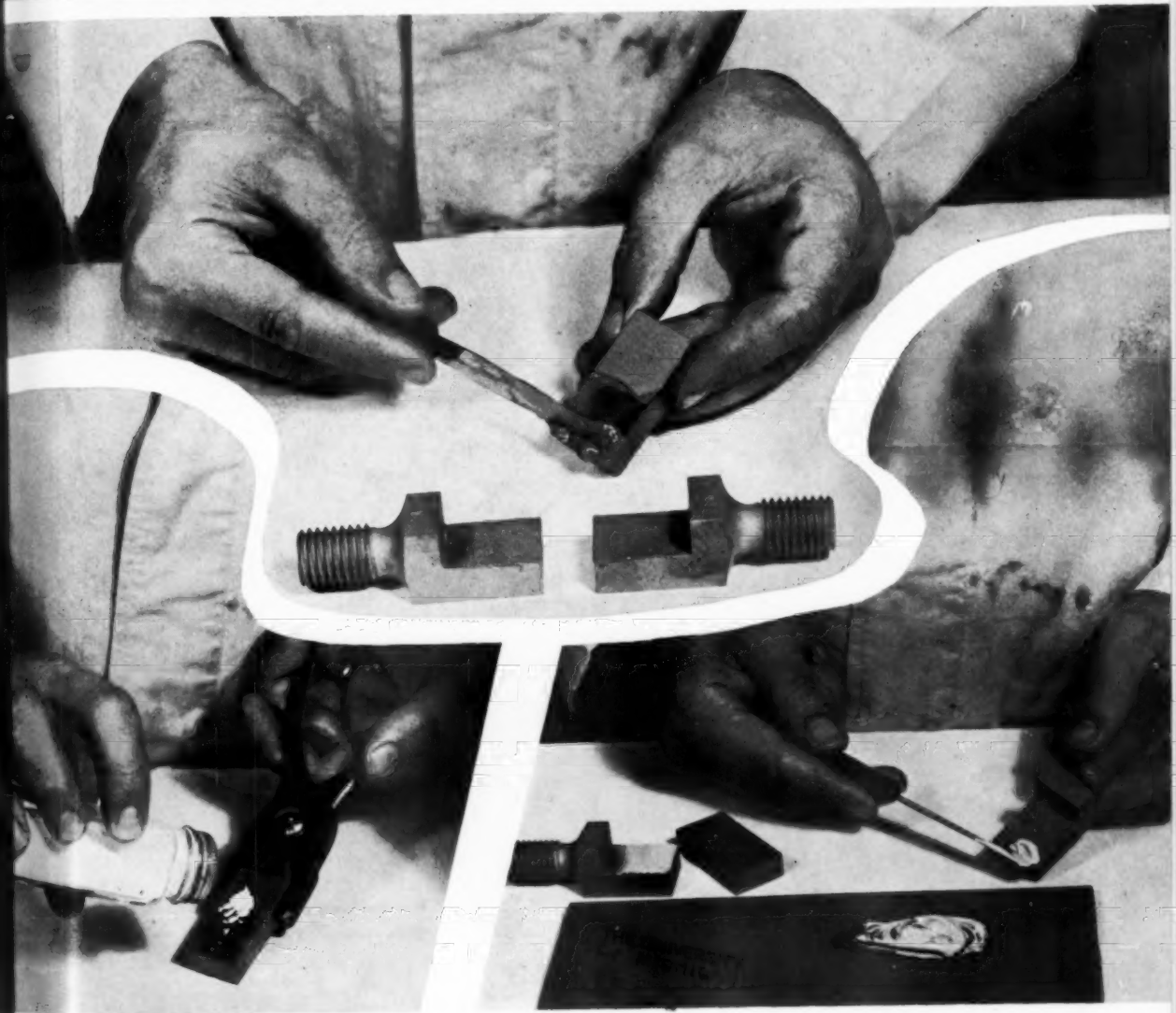
RCH, 1961

ADHESIVES AGE

MANUFACTURE, APPLICATION, TECHNOLOGY, RESEARCH AND MARKETING



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ADHESIVES AGE

AA

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PP PALMERTON PUBLISHING CO., INC.

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EDITORIAL

APPLICATION: PROBLEM AND OPPORTUNITY

Problems mean difficulties. Problems also mean opportunities. Take the adhesives industry. It is a new industry. It has many problems. One of these problems revolves around application equipment. Many adhesives consumers are working with highly sophisticated adhesive formulations—and applying these formulations with rags, old brushes, hanks of hair and whatnot. End result? The adhesive layer is too thin, too thick, not uniform, wasteful, stingy. A problem? Yes! An opportunity? More so!

Producers of adhesive application equipment are, generally speaking, doing a good job. They are trying to keep abreast of a chemical technology which daily sees the development of new adhesives products. These products and their application involve certain considerations: solids content, viscosity, temperature, humidity, control, etc. Quite a few adhesives consumers are unaware of the many new types of adhesives application equipment which have been devised in the past few years. Gluers, driers, sprayers, mixers and a whole variety of special equipment.

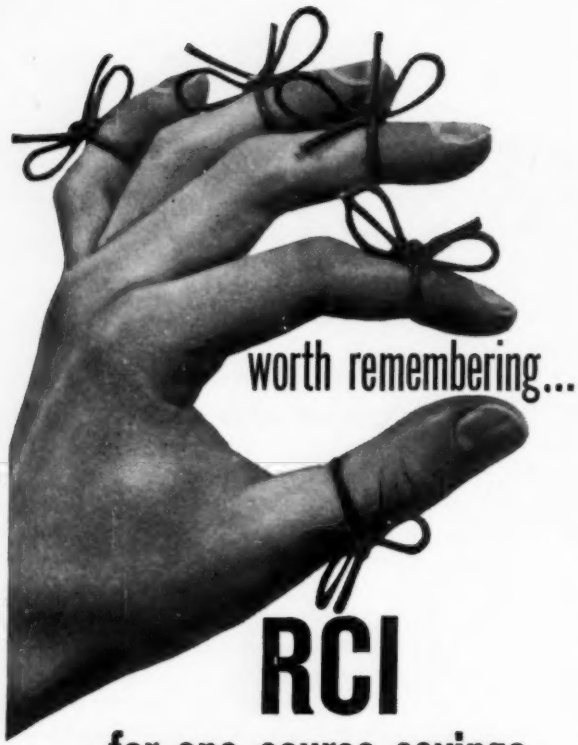
What have some of our consumers been doing? They have been borrowing sprayers from the paint industry; mixers from the baking industry; this from plastics and that from rubber. Some of these units are quite serviceable—they do the job. Others of these units are less than adequate, they serve to complicate the bonding problem.

The adhesives industry is getting to be a big boy. It needs its own equipment. Equipment which has been expressly designed to cope with matters inherent in working with adhesives. A coffee can on a bunsen burner may do somewhat of a job. An electrically-heated glue pot will do it better. A pastry gun may suffice. A glue gun will do it better. Today's mass production techniques, automation and volume consumption of adhesives require specific equipment—tomorrow, new techniques will demand it.

It strikes us that this whole matter of adhesives equipment represents a marvelous opportunity for equipment manufacturers. Adhesives manufacturers, for their part, should cooperate with the equipment people. Only through liaison and cooperation will the adhesive itself function the way it was designed to do. The development of a good adhesive is only half the story. The application of the adhesive, without waste—with economy—is the climax of the story.

The design and manufacture of adhesives application equipment uniquely suited to the needs of the adhesives consumers will open new markets for equipment producers, take full advantage of the properties of the adhesive, and provide the consumer with new efficiency and economy in his operations.

We believe that all three—manufacturers, consumers and equipment people—have a stake in the problem. All three have an opportunity. All three have a responsibility.



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CONSULTANT'S CORNER

By Dr. Irving Skeist

100 Per Cent Reactive Adhesives

Adhesives which are 100 per cent reactive, containing no water or organic solvent, are making rapid gains. The hot melts and the polymerizable resins have many advantages for both packaging and structural bonding:

(1) Impervious surfaces such as aluminum foil, plastic film, glass and steel can be bonded more speedily, since there is no waiting for volatiles to be evaporated before the adherends can be mated.

(2) Hot melts lend themselves to high speed automation on the packaging line. Melt viscosity and other characteristics are easily controlled.

(3) Paper is not subjected to wrinkling or distortion from water. This is especially important in labelling.

(4) The cost, inflammability and/or toxicity of many organic solvents is eliminated.

(5) Heavy thicknesses of glue line are easily built up.

(6) Adhesive ropes, films and pre-pregs are convenient and easy to use.

(7) Because of the simplicity of many hot melt formulae and the absence of some questionable ingredients, it is easier to get FDA approval for food packaging.

Hot melts are thermoplastics. When heated, they become sufficiently soft and tacky to adhere to the substrate. As they cool, they regain their cohesive strength.

Asphalt and wax are our oldest hot melts. Both are dual-purpose materials, acting as moisture-vapor barriers as well as binders. Asphalt as a bonding agent goes into roads, roofing shingles, and kraft paper laminates for multi-wall bags. Its ability to "wet" gravel is often improved by the incorporation of a surface active agent. The surfactant has a polar head, usually cationic, which is attracted to the negatively charged rock aggregate, and a hydrocarbon tail that blends with the asphalt.

Petroleum waxes may be paraffinic—predominantly straight chain—or microcrystalline—branched hydrocarbon. The paraffin waxes give gloss, freedom from blocking, high fluidity. The micro waxes have better adhesion, are often tacky, are generally more viscous. The two types are often blended with each other and with polyethylene, which is a sort of rich-uncle paraffin, or with butyl rubber, which has more in common with the micro waxes. Both of these high polymer modifiers increase the strength of the waxes.

For bread wraps and other food packaging on which high gloss and non-blocking are desired, the emphasis is on paraffins with added polyethylene. The low bond strength of these compositions is actually an advantage, since it permits easier opening of the package. In laminations such as aluminum foil to sulphite paper for candy wraps, or cotton scrim to plastic film for some government packaging, the hot melt is likely to be based on microwaxes.

Polyethylene itself is outstanding as a heat-sealable coating, of course. Milk cartons of polyethylene-coated paper, cheese wraps or polyethylene/cellophane laminate, and a variety of pharmaceutical unit-packs attest to the excellence of the bond obtained when polyethylene is heat-sealed to itself.

Now we have hot melt compositions in rope or pellet form in which polyethylene is the key constituent, often blended with butyl rubber and resins. In addition, vinyl acetate polymers, polyvinyl butyral, ethyl cellulose and various rubbers are useful as bases for hot melts. Plasticizers, waxes and fillers may be added, but there is no need for emulsifiers or colloiding agents. Plasticizers lower the melt temperature or the viscosity at a given temperature, and increase the flexibility of the film.

Incorporating Waxes in Formulations

Waxes also lower melt viscosity, but are usually incorporated for better slip, non-blocking, and moisture resistance. Bleached board cartons for frozen foods are printed with a hot melt in a pattern that may cover only 10 per cent of the surface (for economy), then overcoated with a wax-containing composition for low MVT (moisture vapor transmission). They are shipped flat to the food processing plant, where they are opened, filled, and sealed on automatic packaging equipment. At one time, before the advent of modern hot melt compositions and techniques, it was necessary to dewax the flaps of the filled carton and then seal with liquid adhesive. Now, it is merely necessary to apply heat under contact pressure.

Low viscosity hot melts are gaining wide use for carton sealing, replacing liquid adhesives. Equipment has had to be developed for the efficient application of these materials. A machine is available to handle a hot-melt rope, feeding it in molten form to a heated shoe for application to the carton. Another device, an extruder, is adapted to handle granules of hot melt.

Heat-sealable coatings are also benefitting from the drive toward automation and faster production in packaging. Polyvinyl acetate label coatings, formulated with solid plasticizers according to a patented process, have "delayed tack" when heated, so that they can be made ready several seconds before they are slapped upon the bottles or cans.

Vinyl plastisols are a type of 100 per cent reactive binder of which we shall be hearing more in adhesives circles. A plastisol is a dispersion of vinyl chloride resin particles in a mixture of plasticizers which solvates the resin at elevated temperatures. Recent price cuts in PVC resin make these materials more attractive than ever for the user.

Dr. Skeist is associated with Skeist & Schwarz Laboratories, Inc., 89 Lincoln Park, Newark 2, N.J. He is the author of the recently published book, "Epoxy Resins."

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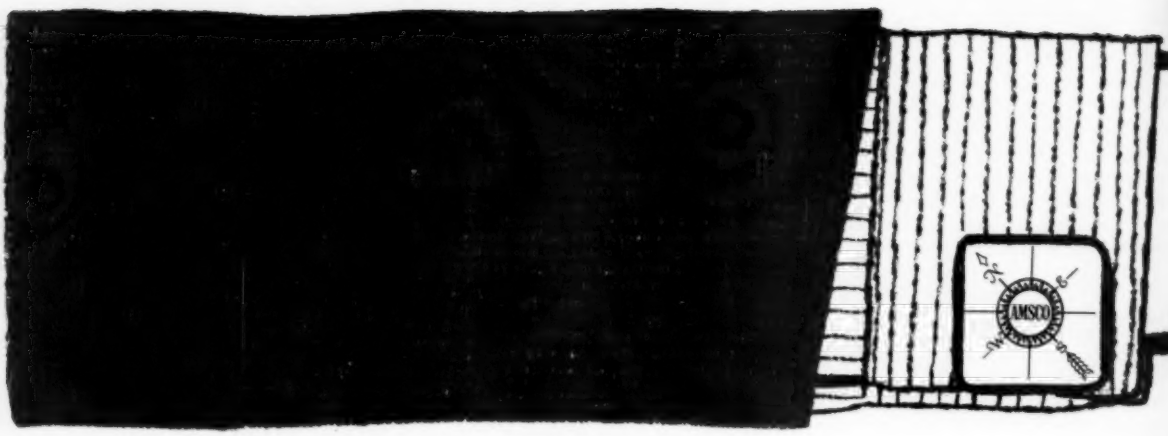
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Butyl Rubber Sealant

Packaged in bulk or in caulk type cartridges, Butylgrip is a one-part, butyl rubber-base caulking and sealing compound. It requires no mixing

or primer. The compound is non-sagging and will not stain stone or masonry, the manufacturer points out. Features include resistance to heat, cold, ozone, ultraviolet, water and weather. It is available in white, gray and aluminum. *Biddle Co.* **P-460**

Contact Adhesives

J-Weld S-793 and S-794 are respectively high- and low-pressure contact adhesives based on synthetic rubber and resins. The flexible, moisture- and water-resistant bonds formed are said to strengthen with age. The adhesives are resistant to most chemicals, oxidation, oils and greases. Application is by spray, brush or machine. A drying time of from five to 15 minutes should be allowed before bonding. Stronger bonds can be obtained by applying a second coat after the first has dried. *Manhattan Adhesives Corp.* **P-461**

Self-Adhesive Teslar

DuPont's new PVF film, Teslar, is now available in self-adhesive form. Coated with a high-strength pressure-sensitive adhesive, the film can be quickly and permanently bonded to a wide range of materials to provide a long-wearing, weatherproof surface. It can be made available in transparent and metallized form, as well as in pigmented colors. *Fasson Products.* **P-462**

Creped Paper Tape

Designed for irregularly shaped objects, Creped Paper Labeling Tapes C-657 and C-658 (yellow and white) have a stain-resistant creped paper backing and a high tack, non-staining, rubber-based pressure-sensitive adhesive. Its special back coating will receive and hold a standard printing ink without offsetting and the high-strength creped backing conforms to irregular surface. The tape has a thickness of seven mils. Its adhesion to steel is 28 ounces per inch width. The tape requires a force of less then one pound per inch width for unwinding and has a tensile strength of 25 pounds per inch width. It is said to have excellent resistance to aging. *Arno Adhesive Tapes, Inc.* **P-463**

Sealing Compound

Said to be permanently flexible, Devcon Tube and Tile Sealer is a quick setting, white compound. Originally developed for plumbing applications, it can be used for caulk-

ing and sealing around tanks, windows, air ducts, water lines, electrical boxes, etc. It bonds to wood, plastic and ceramic tile, wallboard, and many other surfaces. The compound is supplied in six-ounce plastic tubes with long applicator nozzles for crevices. *Devcon Corp.* **P-464**

FOR MORE INFORMATION on these new products use the Readers Service Coupon in this issue.

Electrical Holding Tape

Acetate film insulation, glass filament strength and a solvent-resistant thermosetting adhesive are some of the features of Scotch brand electrical tape No. X-1131 which is designed to replace cotton cloth and paper tapes in many holding applications. The adhesive is not affected by solvents such as naphtha or xylol even before setting. The average thermosetting cure cycle is two hours at 130°C. After curing, the seven-mil tape resists softening at high temperatures, or "throw out" caused

by high-speed rotating equipment. X-1131 has an electric strength of 5000 volts, a tensile strength of 130 lb./in., and an electrolytic corrosion factor of 1.00. *Minnesota Mining & Mfg. Co.* **P-465**

Acrylonitrile Cement

Especially designed for bonding many types of rigid and unsupported vinyl products, H-523 Ubabond is a modified acrylonitrile rubber-based cement. Heat or room temperature cured, the adhesive has a high initial bond strength that is said to increase upon aging. It has a long color life and can be used under a wide range of temperature and humidity conditions. When dry, H-523 remains tack-free, is oil resistant and provides a strong flexible bond. It can also be used in applications involving steel, tinplate, leather, wood, glass, ceramics and paper. *UBS Chemical Co.* **P-466**

PVA Adhesive

Developed for modern folding box manufacture, Solu-Rez 54-10301 is a fast-setting polyvinyl acetate resin adhesive recommended by the manufacturer for operations requiring deep bite and high speed. It can be cleaned from machine parts and reservoirs with water alone. Elimination of viscosity build-up under agitation obviates the need for daily clean-up

operations. The surface film formed in standing may be redissolved in the adhesive. Because of its high-solids content and low viscosity, the adhesive is said to provide excellent mileage, permitting adjustments to a fine film and little penetration of the adhesive into the board. *Morningstar-Paisley, Inc.* **P-467**

Foam Cement

Exceptionally fast drying is said to be available even under conditions of high humidity with Softouch 555, a polyether and foam fabricating cement. Low viscosity and high solids make it especially good for easy brushing and production roller coating, according to the manufacturer. The adhesive dries colorless and imparts a transparent glue line which will not turn rusty or deteriorate the foam. *Imperial Adhesives, Inc.* **P-468**

Vinyl-to-Metal Adhesives

Four types of adhesives are included under the designation of Vy-Metal, a new line of bondants for vinyl-to-metal applications. The first is a curing adhesive with heat resistance and hardness that can be controlled by varying curing time and temperature. The second is a simple-to-use thermoplastic. The third is a heat-resistant adhesive for very deep draws which allows stress distribution. The thermosetting adhesive that completes the group is said to offer unusual heat resistance along with excellent adhesion and good deep drawing properties. All types provide a tear bond. *National Starch and Chemical Corp.* **P-469**

"Laminate? I thought you said lemonade."

Pressure-Sensitive Adhesive

A cold-setting, pressure-sensitive adhesive, Rez-N-Glue 298 is said to be particularly well suited for manual or mass production application of paper and paper-backed labels to polyethylene containers and sheet packaging. Non-staining and non-crystallizing, the adhesive is said to assure adequate bonding under extended exposure to ultraviolet light and heat, without impairment to product appearance. *Schwartz Chemical Co., Inc.* **P-470**

Heat Seal Adhesive

A new heat sealable coating for cellulose acetate film, 2p-240C Heat Seal Adhesive can be used for laminating acetate film to paper for applications such as index tabs, skin or blister packaging. The adhesive may be applied by roll coater or rotogravure, is non-blocking and readily usable over a wide temperature range. Precoating cellulose acetate film with the adhesive for blister packaging is said to result in economy and efficiency as compared to coating board on a sheet coater. *International Coatings Co.* **P-471**

The first U.S. space vehicle capable of making a "soft landing" on the moon, will start its journey in a 20-foot plastic shell—light, strong, and fabricated from Narmco's temperature-resistant CONOLON 506. The nose cone of the giant CENTAUR is an outstanding example of the adaptability of CONOLON 506 to applications which involve complicated assemblies such as the fabrication of the nose cone.

Narmco reinforced plastic laminating materials are produced in the form of rolls of fabric (such as asbestos, glass, nylon) impregnated with synthetic resins. Any number of layers can be used to build up structures of the desired strength and thickness. Epoxy, phenolic, polyester, and silicone laminate materials are available from Narmco as standard factory items. CONOLON 506 is woven glass fabric impregnated with modified phenolic resins, and is qualified to MIL-R-9299 Type I (general purpose) and Type II (heat-resistant), Class I (10 to 50 psi cure pressure).

In addition to the sophisticated fabrication of nose cones and missile parts, CONOLON 506 is also ideal for ducting, skin surfaces, fairings, molded accessories, metal close-outs, and many other applications. Under proper conditions, CONOLON 506 has a shelf life of six months, or more. This laminating material is also available in a variety of lengths and widths.

Goodyear-built RCA Radome, made of paper honeycomb core, and faced with CONOLON 525 skins.

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capitol cues

SOME CAUTIOUS OPTIMISM ABOUT THE BUSINESS OUTLOOK is cropping up in Washington these days. President Kennedy's economists see the trend as still downward--but they now think they can see when bottom will be reached. They wouldn't be surprised if it occurred this Spring--by May or even April.

The consumer will help quicken the pace of business. He has been saving at a high rate, but is beginning to need goods. When he does start buying, dealers will have to rebuild stocks. The federal government will provide additional lift. Spending for defense, highways, public works, etc., will be increased soon. Expanded unemployment compensation is coming, too.

Here's the trend of business that the experts now foresee:
-In the first quarter, business will continue to ease further.
-In the second quarter, the trend will level out. Business will begin to feel the effects of larger U.S. expenditures.
-In the third quarter, consumer spending will bring an end to inventory-cutting and federal outlays will keep rising.
-In the fourth quarter, business will pick up a bit more speed.
Even then, it won't be really rolling...just gaining some. Officials fear it will take two years to get things roaring.

YOUR COSTS WILL RISE AGAIN THIS YEAR--wages, taxes, and materials. That's the conclusion we get from analysts in both government and industry. Unfortunately, the rise in sales volume that is expected later in the year won't be great enough to lower unit costs. A squeeze on profits will be the result. Businessmen won't be able to pass cost hikes along in 1961. There are two reasons: Competition will be keener and buyers are price-conscious.

The outlook for price increases is for a gain of about 1% in wholesale prices and 1½¢ to 2% in consumer prices. Industrial goods will firm in the second quarter. Metals will go up first and machinery, lumber, and other building materials later on. Service costs will account for the increase in consumer prices.

Here's the story on wages, industry's largest single cost:
-Wage negotiations will yield an average increase of 9¢ an hour--8¢ or so in manufacturing, 11¢ in nonmanufacturing.
-Escalator clauses in many contracts will bring automatic hikes for part of this--3¢ to 4¢--for 2.8 million workers.
-Fringe benefits will add still further to labor costs.

This is what you can expect on taxes as the year moves along:
-At the state-local level, new income taxes and sales and gas levies will noticeably increase the costs of doing business.
-At the federal government level, business can expect higher payroll taxes to finance a big unemployment insurance program. Social security taxes may go up, too if President Kennedy's program for medical care for the aged is adopted.

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THIS MAY BE AS GOOD A TIME TO BORROW as any that's likely in 1961. That's the view of a growing number of monetary specialists. They look for very little, if any, further decline in rates of interest. An early end to the recession is the leading reason for this. In other words, the demand for loans will begin to increase soon. Most experts in Washington believe that the Federal Reserve Board won't let interest rates ease much further.

THE PRODUCTIVITY OF AMERICAN INDUSTRY ISN'T EXPANDING as fast as it has in past years. During 1960, the output per man-hour for all manufacturing workers went up only 2.7%, compared with a 6.8% gain in the prior year. What is worse, the index halted its rise last Winter; it is down about 1% from the 1960 high. And this measurement of output may fall more before rising again. Since 1957, output per man-hour of all manufacturing employees went up 11.4%. Over that same period, government experts say wages and fringes rose 13%.

LABOR NEGOTIATIONS WILL BE FAIRLY ROUGH THIS YEAR. All signs point to a tough attitude by management and a refusal to give ground on sweeping union demands. Labor leaders realize that rising unemployment will reduce their bargaining power but they expect some help from the new Administration. The unions will center their demands on retention of escalator clauses, on expansion of severance pay and on efforts to establish shorter work-weeks. On wage rates, as already noted, settlements will average around 9¢ an hour.

> The settlement of the tug-boat dispute in New York in January set a pattern: It showed that the Kennedy Administration won't stand by while major strikes cripple the economy. Secretary of Labor Goldberg moved in quickly and worked out a formula to get the trains running again. In the future, he may move to intervene--before strikes reach the disaster state--using the President's influence and prestige to shorten or avert walkouts.

SOME IMPORTANT TAX CHANGES ARE LIKELY THIS YEAR. The new President's advisers, including Treasury Secretary Dillon, have already singled out some objectives for action at this session of Congress. Their aim is to get a set of recommendations to Congress by April 1, in time for action before Congress adjourns. They aren't talking about a temporary tax reduction which may come if business gets worse. They want to plug loopholes and spur investment.

> Here's what Kennedy's advisors probably will recommend:
> -Repeal of the dividend credit--a Democratic campaign promise.
> -Withholding taxes on dividends by the paying firm. This is aimed at collecting large sums now said to be escaping taxes. Withholding taxes on interest payments isn't being considered now. The large number of small interest-payers is a problem.
> -Tightening up on expense accounts to end what Kennedy people term abuses--indirect benefits in lieu of salary increases.
> -Liberalizing depreciation allowances, to encourage business investment in new equipment. One idea is to exempt from taxes outlays in excess of depreciation being taken. Also under study is allowing depreciation at replacement value.
>
> Congress probably will buy the bulk of this package. Kennedy will sell it as a first step in a long-range program to reform the Tax Code and bring reductions in rates for individuals.

TECHNOLOGY OF ADHESIVES AT YOUR FINGERTIPS

SERVICE

Subscribers to ADHESIVES AGE may now obtain, from one central source, technical literature dealing with all aspects of the adhesives industry. One or more of the books listed here may be of invaluable assistance to you. Look this list over and check the books suited to your needs.

- **Adhesive Bonding of Reinforced Plastics—H. A. Perry. $8.75.** Survey of the design and assembly of structures and products, particularly glass-fiber-reinforced plastic products, by means of adhesives. Gives data on equipment and methods used to produce adhesive bonded joints. ☐

- **Adhesive Bonding of Metals—G. Epstein. $2.95.** Considers adhesives used with metals, indicating when an adhesive-bonded joint is advantageous; the type adhesive to use; how to use it, and how to design the joint for optimum performance. ☐

- **Epoxy Resins—Their Applications and Technology—H. Lee and K. Neville. $8.00.** Guide to the field of epoxy resins, covering the chemistry of their preparation and applications, including a section on adhesives. ☐

- **Polyamide Resins—Donald E. Floyd. $4.50.** Discusses in detail various important applications of the polymers belonging to the polyamide resin family and includes a comprehensive section on adhesives. ☐

- **Principles of High Polymer Theory and Practice—A. X. Schmidt and C. A. Marlies. $14.50.** Study of the principles of high-polymer theory and practice, with a section on adhesives, their applications, and mechanisms and factors involved. ☐

- **Recent Advances in Gelatine and Glue Research—G. Stainsby (Editor). $12.00.** Study of Collagen, and its protein gelatine, comprising papers and Proceedings of an International Conference of the British Gelatine and Glue Research Association. ☐

- **Vinyl Resins—Mayo Smith. $5.75.** Surveys applications of vinyl resins with information on their types, properties, chemistry, manufacture and fabrication. Includes information on several types of adhesives in this category. ☐

- **Epoxy Resins—Irving Skeist. $5.50.** A chapter on adhesives is included in this complete study of the entire field of epoxy resins. The author gives formulations, trade names, methods of manufacture and applications. ☐

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• **Rapid Cure Adhesives.** A new film type adhesive has been developed which can be cured with exceptional rapidity at temperatures of from 300°F. to 400°F. According to the *Financial Times* published in London on January 18, 1961, it yields a tensile strength of from 5000 to 7000 pounds per square inch depending upon the exact nature of the compound used and the requirements of the job.

Curing cycles for the film can be as low as one minute and the final cured film-bond is rigid yet resilient. It is also said to be highly resistant to water, oils and other hydro-carbon fluids, brake fluids and most solvents. The adhesive can withstand intermittent exposure temperatures of up to 450°F. It can be used to bond metals-to-metals and synthetic rubber or laminates to metal and a number of other different types of materials. The adhesive is to be manufactured in tape weights of up to 15 inches and can be made available in thicknesses of some 0.01 to 0.03 inch. Samples will soon be made available for test purposes and production on a commercial scale will follow shortly.

• **U.S. Department of Commerce Assists in Developing Export Markets.** In previous issues we have described the tremendous amount of assistance which the Department of Commerce offers to American manufacturers. Here are a few examples of what the close cooperation between an American manufacturer and the Export Services of the U.S. Department of Commerce have produced:

The exclusive international distributor for a glass tinting process which eliminates or substantially reduces fade, glare and heat, doubled its overseas sales each year since 1956 when it obtained the worldwide distributorship of the product from the United States manufacturer. For the first five months of 1959, their sales were in excess of $172,000. By the end of 1959, they were estimated at $525,000. The firm predicted that by the end of 1960 their overseas sales would surpass $1,000,000. They now have 31 foreign representatives in 26 countries.

The vice-president in charge of export sales regularly visits the Commerce Department field offices in his area and has made extensive use of the trade lists service and other trade information submitted by the Foreign Service in developing overseas facilities for sales. In his latest report, he expected to add at least 12 more foreign representatives and had appointments pending in India, Australia, Central and South America, Western Europe and Africa. He is also working on the establishment of dealerships in Greece, Turkey, Hong Kong, Singapore and other Far Eastern points.

A firm in Utah was encouraged by information originating in the U.S. Embassy in Paris to exhibit patented laundry presses at the International Laundry Owners Exhibition in Paris. $15,000 was appropriated by the firm to cover this first trade exhibit. The company, incidentally, found that they were the only American firm having an exhibit at that fair.

Sales as a result of that showing were in excess of $250,000. This was in 1955, and the firm was so encouraged that it continued efforts to penetrate the European market. The following year their exhibit at the Laundry and Dry Cleaners Show at Frankfurt, Germany, produced $325,000 worth of business.

While the firm's success in Europe is attributable to trade fairs, this is not the basis of their success in South America. In 1959, their foreign sales manager traveled for 60 days in Venezuela, Mexico, Costa Rica, Peru and Ecuador, following suggestions from the Foreign Service and the Department of Commerce. As a result, he realized approximately $300,000 worth of new business. Their total exports from 1959 amounted to 20 per cent of their total $5,000,000 business.

What others can do, you can do too! At least, you can inquire about the possibilities of increasing your exports. Just call your nearest field office of the U.S. Department of Commerce, for an early appointment.

• **Metal Bonding.** This technique is already extensively used in Europe and recently the Technological Institute for Handicraft (Handwerkstechnisches Institut) in Vienna published an elaborate booklet entitled "Metall Kleben" (Bonding of Metals). The bonding technology is explained in six chapters consisting of 40 profusely illustrated pages. Advantages and disadvantages of metal bonding are compared in the booklet and the circumstances when metal bonding is possible and appropriate are carefully analyzed.

The most important adhesives are defined, described and their qualifications and characteristics explained. The use of the adhesives is analyzed, the different constructions of the various joints of metal are explained and the range of practical applications described and illustrated. It is deplorable that among the fourteen sources of supply only three American companies are mentioned: Eastman Chemical Products, Minnesota Mining and Manufacturing Co., and Rubber and Asbestos Corp. In addition, the list of reference material used does not contain a single American or English publication.

ADHESIVES GUIDE

by JOYCE HURD

• A Practical Handbook

designed to serve as a guide to the types of adhesives available for bonding various materials in various applications. This new British publication covers adhesives used in woodworking, bookbinding, footwear, etc., and offers valuable data on the advantages of adhesive bonding and the classification of adhesives.

Topics Covered

Choice of Adhesives for Various Materials.

Encyclopedia of Basic Adhesive Types.

Classification of Manufacturers (British) by Basic Types of Adhesives Made

Catalog of Adhesive Manufacturers and Their Products

Trade Name Index (British)

Miscellaneous Adhesive Recipes

British Organizations Concerned With Adhesives

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With contents including data on something like 400 individual adhesives made by about 100 different manufacturers, this publication will prove to be a valuable edition to your technical library. More than 50 main types of adhesives and their properties are covered!

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On The Continent (cont'd)

Anybody who knows any German should request a copy of this booklet from the Handwerkstechnisches Institut, Bauernmarkt 13, Vienna 1, Austria. We would also suggest that every manufacturer producing adhesives which can be used for metal bonding should put his leaflets and literature in an envelope and mail it to the same address in order to establish contact between this very important institute and American sources.

• **Why Do We Neglect Germany's Mail-Order House Boom?** Hundreds of products are available in U.S. department stores and supermarkets which could be sold in large quantities by Germany's 3000 mail-order houses. This is the considered opinion of Mr. Leon Kelston, Commercial Officer of the American Consulate General in Frankfurt/Main. He discusses the topic in *Commerce in Germany*, the official monthly publication of the American Chamber of Commerce in Germany.

Half of all small town and country households in Germany now buy from catalogs. So do a fifth of all those in cities of half a million or more. The combined sales of the 20 largest German mail-order houses alone is estimated at $500,000,000 annually.

Since the American type shopping center is not very widely known, catalog buying is convenient for householders who live considerable distances from shopping areas. In addition, now that more women than ever before work and find less time to shop—federal law confines store hours to daytime—local agents of catalog concerns are welcomed. A number of large mail-order houses have repeatedly expressed their great interest in many American consumer goods.

• **US-Swedish Polyethylene Factory.** Union Carbide Corp. and Superfosfat Fabriks AB, Stockholm, will form a joint company called Uni-Kemi AB for building and operating a polyethylene factory at Stenungsund on the Swedish west coast. The factory will have an initial capacity of 13,500 tons of high-pressure polyethylene annually.

Each partner will contribute half of the $7,770,-000 capital for the new company. Union Carbide will contribute technical know-how and methods plus deliveries of polyethylene, which will make it possible to start sales on the Scandinavian market before the factory goes on stream. Construction work will start this spring.

• **U.S. Trade Mission Finds French Market Lucrative.** A few days ago the members of the French Trade Mission which visited France for a number of weeks reported on its success during an all day conference. The members unanimously believe that the 1961 Dollar-Trade Liberalization opens the door for the first time in over a generation to new markets for many products in France. With the French people enjoying the highest level of prosperity they have ever known, consumers are spending more on creature comforts.

However, many American articles cannot be found in France because the American manufacturers have made no effort to sell them. This in spite of the fact that French competition is overpriced. The price tag on French goods is higher than that on comparable merchandise in U.S. stores.

The Mission found a lively interest in increased business relations with the United States, particularly on the part of small and medium-sized French firms. While the Mission's principal aim was to find sales possibilities and outlets for American exports, many French businessmen wanted to establish licensing arrangements for the manufacture of U.S. goods to be sold in France and other Common Market countries.

Following are only a few of the business leads which the Mission brought back:

Ets. Cluzel & Cie., Lyon (Rhone), a manufacturer of gummed tape is seeking a joint venture with U.S. manufacturers of adhesives.

Camoin Construction & Co., St. Cyr (Var), manufacturer of cement tiles, is seeking U.S. participation in a joint venture to convert operations to the manufacture of plastic floor tiles.

Jarach Produits Chimiques, 107 rue du Velodrome, Canderan (Gironde), is interested in buying basic organic and inorganic chemicals.

Klein et Roubinet, 47 bis, blvd. Pasteur, La Courneuve, Paris (Seine), is interested in buying raw materials for paints and varnishes.

M. Avot de St. Sauveur, Ets. Avot-Vollee, 7 quai du Chattlier, Ile Saint Denis (Seine) is interested in buying plastic sheets or other synthetic products for lining food packages. They are also interested in new products or techniques for packaging cookies and liquid foods.

Contact should be established directly with the indicated companies. Additional information concerning the tremendous success of the French Trade Mission is available in all field offices or the main office of the Department of Commerce, Washington 25, D.C. The New York Field Office is located in the Empire State Building.

• **Price Increases of Adhesives in Germany.** Increasing wages, salaries, freight, packaging and a number of other factors will soon compel the manufacturers of adhesives in Germany to increase their selling prices. A number of raw materials went up in price, particularly rosin, and quite a number of synthetic resins became more expensive during the last year. As a result, the industry contemplates a general price increase which will amount to 20 per cent in some cases.

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A new fully revised and up-dated edition of

RUBBER TO METAL BONDING

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1959, 296 pages, with bibliography

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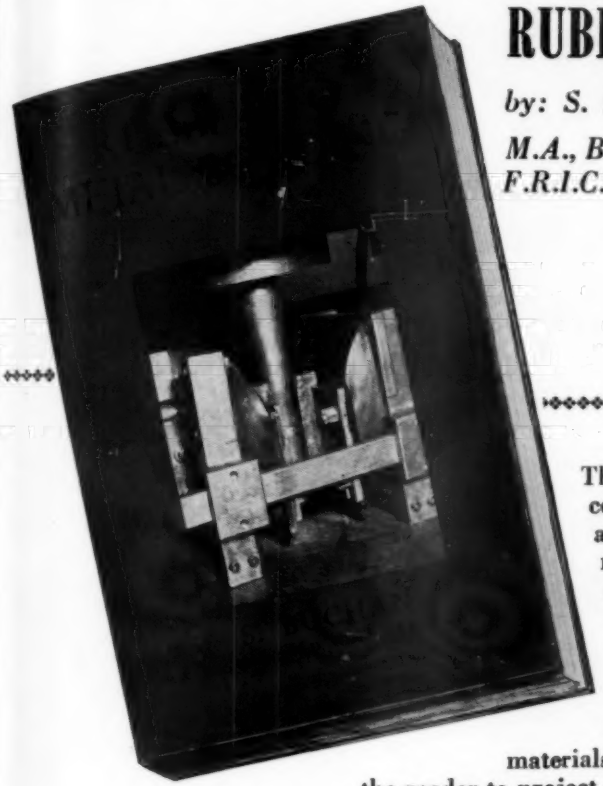

This new edition of Dr. Buchan's important and comprehensive work, has been completely revised and up-dated to include the many advances and new developments in the technology of bonding rubber-to-metal in the 10 years since the publication, in 1948, of the widely-acclaimed original edition. Describes processes, applications and methods in detail. Gives concise, straight-forward explanations of how to handle rubber-to-metal bonds at each stage of the job. Sufficient materials are included with each description to permit the reader to project given examples to his own needs. Written by the chief chemist of one of the most successful bonding firms in the world, this is the single most complete source of information about a subject of major technical importance to men working in the rubber adhesive industries.

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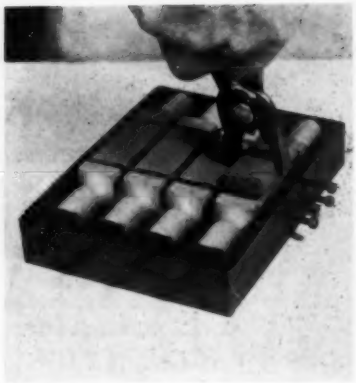
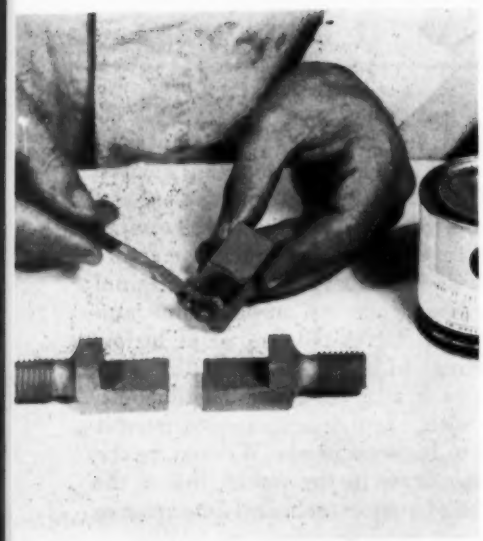


In the system using a one-part thermalsetting powder, parts to be bonded are first heated to from 250° to 300° F. Spread assemblies are put in a special jig for heat curing.



The cold application system illustrated above uses a one-part thermalsetting epoxy paste formulation. The spread parts are assembled and cured for one hour at 350°F.

To prepare the room temperature curing paste, equal amounts of resin and hardener are mixed and spread on the parts. The assembly will cure completely in 30 hours at 72°F.

By W. E. FAWCETT
Project Engineer
Kennametal, Inc.
Latrobe, Penna.

Three Epoxy Systems for Bonding Carbide Wear Parts

In the past five years, epoxy cements have taken vast strides, winning recognition in many diversified industries and opening up more and more new applications. For example, in the production of cemented carbide tools, blanks and wear-resistant parts, new epoxy formulations and systems now make it possible to join large areas of tungsten carbide to many other dissimilar metals.

Because of its low coefficient of expansion—2.9 x 10^{-6}—tungsten carbide could not be readily joined to metals of different thermal expansion rates at the elevated temperatures required by soldering techniques. This was because of the thermal strain and distortion introduced into the part during cooling. However, new epoxy systems which cure without heat, or in the relatively low temperature range of 250° to 450°F., have brought this problem under control.

As the demand for epoxy cements grows it becomes necessary to have many different types or formulations in order to meet the varied requirements. This article will discuss three systems that are outstanding in one or more properties necessary in bonding tungsten carbides to various base metals:

(1) A one-part thermalsetting powder commercially designated as Bondmaster M-640.

(2) A one-part thermalsetting paste commercially designated as EC-2086.

(3) A two-part room temperature setting paste commercially designated as Epoxi-Patch.

In most wear parts, block shear strength is generally more important than either tensile shear or peel strengths. An average block shear strength for each of the epoxy systems listed above was arrived at by running 16 or more tests on each.

The block shear specimens used had threaded ends so that they could be held in a Tinius Olsen testing unit. All specimens were aligned in a special jig for curing under controlled temperature and pressure in an hydraulic platen press. After the cure, a record was made of the shear load required to break the bond in the Tinius Olsen unit.

Block Shear Strengths

The following average block shear strengths are the results of these tests:

(1) For the one-part thermalsetting powder: 7240 psi.

(2) For the one-part thermalsetting paste: 7240 psi.

(3) For the two-part room temperature setting paste: 4360 psi.

The application of epoxy resin cement is very simple if a few basic rules are followed. The fit is, of course, always important. The joint should be from .003-inch to .006-inch in thickness to assure maximum strength in the bond.

Faying surfaces should always be free of all dirt, grease and scale. A liquid cleaner such as carbon tetrachloride will remove grease and oily dirt, but grinding or sand blasting are best for removing oxides or scales.

When using the one-part thermalsetting powder, we preheat the parts to from 250° to 300°F. An even coat of the powder is then applied and the parts assembled for curing.

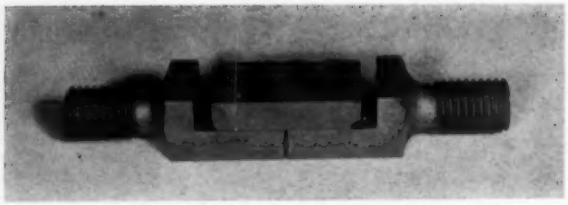
With the above system, we have worked out the following cure times which seem to give us the best results: at 250°F. a minimum cure time of 24 hours—no maximum cure time; at 275°F. a minimum cure time of ten hours—no maximum cure time; at 300°F. a minimum cure time of five hours—no maximum cure time; at 325°F. a minimum cure time of two hours—no maximum cure time; at 350°F. a minimum cure time of one hour—no maximum cure time; at 400°F. a minimum cure time of 30 minutes—maximum cure time is 24 hours; at 450°F. a minimum cure time of 15 minutes—maximum cure time is one hour.

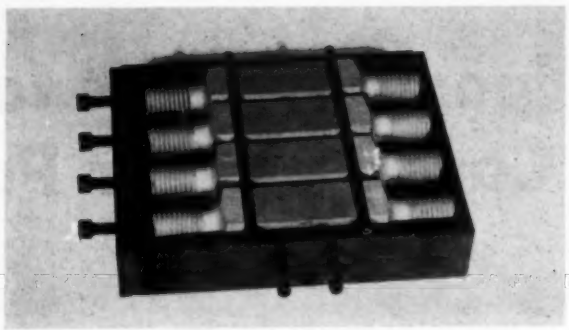
When using the one-part thermalsetting paste, the epoxy is evenly applied over the cold surface of the parts to be bonded. The unit is then assembled and cured for 60 minutes ±one minute at 350°F. ±2°F.

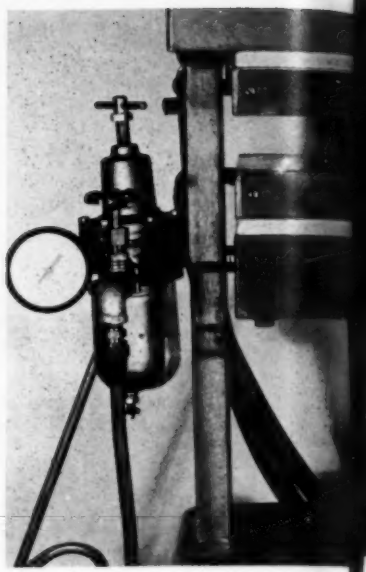
The two-part room temperature setting paste is prepared by squeezing equal lengths of resin and hardener onto a mixing surface. After the two components have been thoroughly integrated, the paste is evenly spread on the bonding surfaces of the parts which are then assembled and allowed to set for one to two

About the Author . . .

WILLIAM E. FAWCETT has, during the past ten years, developed various methods of fastening carbides to other base metals. He is a North Carolina State College graduate.







A block shear specimen, photo on upper left, such as those used in the tests described in this article. The threaded ends enable the specimen to be held in a Tinius Olsen for shear load testing. Note the cement joint on the centerline of the specimen.

The jig used for alignment of the specimens during the curing period is shown at the bottom left. Each system described requires that care be taken in applying the adhesive so that there is no squeeze out. Excess adhesive should be removed with trichlorethylene. A soap coating helps prevent adhesive on non-bonding areas.

In the center of the page is an hydraulic platen press of the type used to control pressure and temperature during curing. Even where manufacturer's specifications do not call for pressure on the joint, Kennametal researchers have found that they obtain more constant thicknesses and higher bond strengths by using clamps.

Block shear tests of the specimens are made with a Tinius Olsen, photo on extreme right. Pressures exerted to break the joint are recorded on the dial on the right of the technician. Maximum strengths are generally achieved by temperature curing cements.

hours. Complete cure of the part requires 30 hours at 72°F. room temperature.

In each of the three systems, care should be taken not to get an excess of adhesive on the joint as it will be difficult to remove after curing. The excess should be immediately eliminated by scraping or wiping carefully with a rag dipped in trichlorethylene. Coating with soap or silicon grease will prevent adhesion to non-bonding areas.

Although some manufacturers do not call for the use of pressure on joints, it has been found that more constant thicknesses and higher strengths are obtained by clamping. The use of "C" clamps or platen presses not only help to control the joint thickness, but tend to prevent parts from moving in relation to each other during the cure.

There are many factors in selecting the proper cement for a wear application. A few of the more important ones are:

(1) Maximum strength required of the cement.

(2) Physical dimensions and possible distortion of the assembly.

(3) Ease of applying the cement to the faying surfaces.

(4) Shelf life and pot life of the cement.

(5) Curing time and temperature of the epoxy system.

Let us examine these points in a little more detail. Often the other selection factors will have to adjust themselves to the bond strength required. However, on many applications extremely high strengths are not necessary, or the design can be made to reduce the strength required of the cement.

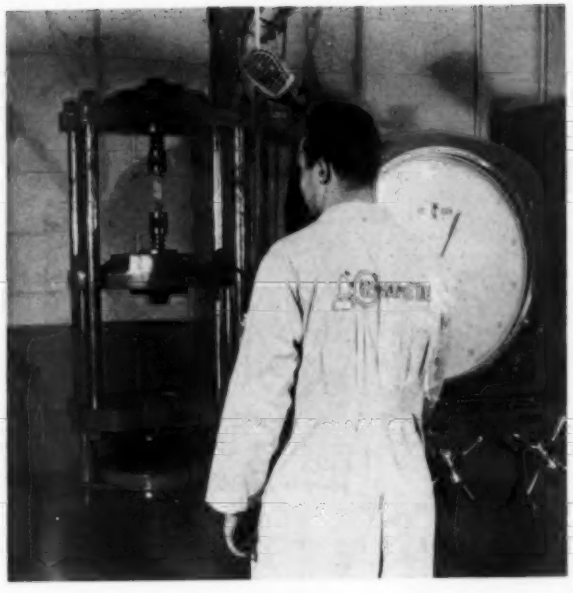
Maximum strengths are generally achieved through the temperature-curing epoxy cements. This may mean the problem of distortion of the workpiece will have to be met, especially on knives and various other parts where extreme lengths and thin cross sections are encountered. Here again, the design can be made to absorb part of the load and permit the use of room temperature setting epoxies that eliminate distortion caused by the coefficient of expansion differential.

Ease of Application

Ease of applying the cement must be considered on each wear part produced. In many cases it is more convenient to spread a smooth even coat of paste on a cold workpiece than to apply a powder cement to a hot workpiece.

If the part to be cemented is a production item, the shelf life and the pot life of the cement become important items. A short shelf life makes maintenance of an adequate inventory a problem.

Pot life is the usable time from mixing to partial hardening which makes it impossible to apply the cement to the joint without loss of



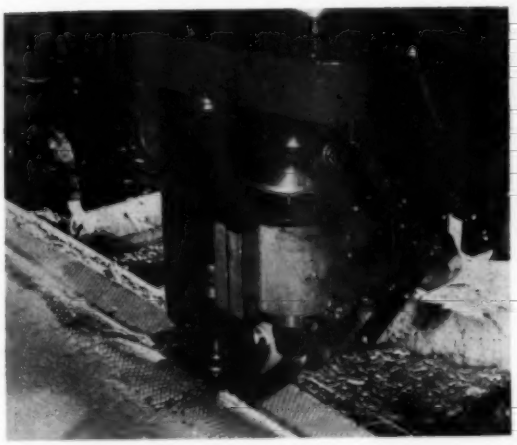
strength. The pot life of most two-part cements is shorter than the one-part temperature curing materials. In applying the two-part cements, only the quantity that can be used during the pot life should be mixed.

The curing time and temperature are important variables since lower temperatures for longer periods reduce the distortion and internal strain on large bonded areas where the higher strengths of temperature-curing epoxies are desired. This makes it advantageous to be able to use a wide range of temperatures for curing.

In industries other than our own, successful application of epoxy cements to bond carbide to other base metals includes: nozzles, ball mill liners, micropulverizer liners, pivots and balances for scales, feed pawls on sewing machines and set edges for blanking dies.

Many fabrication problems can also be overcome by using epoxies for holding small parts for machining operations, bonding steel to non-magnetic materials to be held in magnetic chucks, and cementing temporary centers on carbide or other parts for grinding.

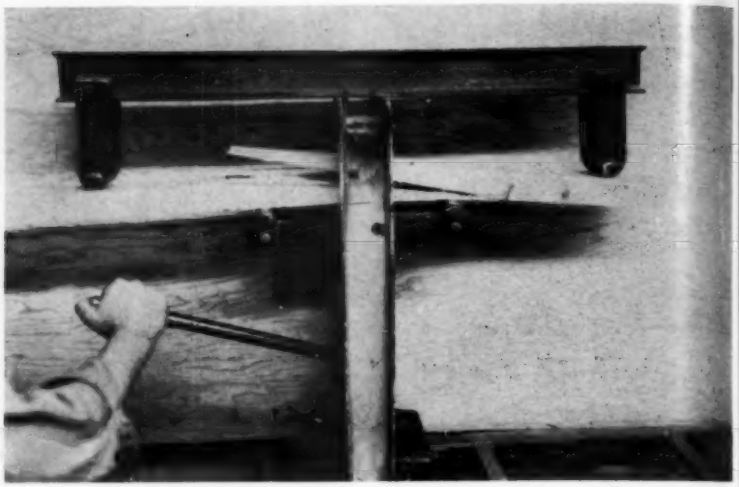
The vast number of uses for epoxy cements is rapidly growing through improved cements and growing knowledge of how to apply them. However, lower curing temperatures and higher strengths are still desirable for metal-to-metal bonding of carbide wear parts.



A thin ten-inch diameter carbide cutting ring is held on a steel hub by both mechanical and epoxy bond to give maximum safety in event of breakage at high rotational speeds.

An adhesive bond for a Kennametal surface plate on a needle anvil is oven-cured while held in C-clamps. When brazing was used joint sometimes broke and separated the carbide during shipment.

by R. E. WIRTH
Rilco Laminated Products
First National Bank Bldg.
St. Paul, Minn.



Breaking a scarf joint in a bending jig to determine the amount of wood or glue failure. The use of control pieces cut from the same board makes it possible to obtain results which compare the value of the joint with that of the solid wood and the design strength.

Evaluation and Control Tests for Structural Wood Laminates

The most serious problem facing the industry is continuous and conscientious use of testing methods available

The structural wood laminating industry is gradually developing uniform product qualification methods and establishing performance standards. For most operators, this will eventually lead to complete quality control by continuous surveillance over design, raw materials, process capability, production control, process control, and finished product inspection.

Since these products generally become the basic structural frames for all types of buildings, they perform primarily in the protection of life and property. Because no practical non-destructive tests exist for evaluating the finished members, it is essential to provide continuous evaluation and control of individual components and procedures within the limits of proven standards.

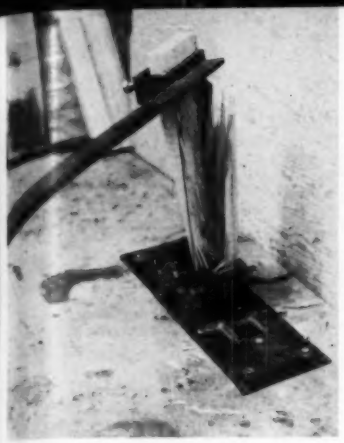
For the purpose of this article, the usual testing program maintained by a laminator will be divided into three categories: evaluation of product and and process capability, testing and control of raw materials, and surveillance of process and production control. Although we shall be primarily concerned with testing for production control, it is essential to consider briefly some of those tests made intermittently on production sampling to assure that the product itself is uniformly in conformance with the standards.

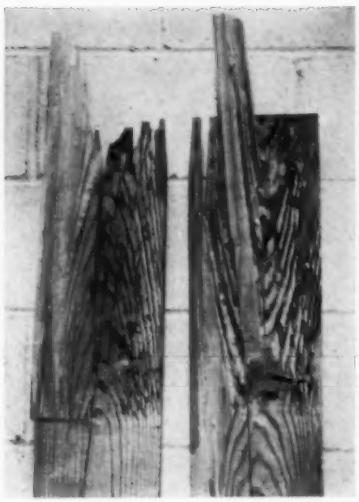
In order to evaluate the product and process capability, it is necessary to provide standards with numerical values required by design, so as to be able to compare them with test results of production sampling. Testing in this category requires controlled procedures to develop actual values and is ordinarily done intermittently or as required by changes in materials or processes. Allowable working stresses are established for the wood, and adherence to grading rules accomplishes a specific comparison to the standard.

Strength and durability criteria for adhesives are established by the industry and this data also provides means of measurement and comparison to performance standards. Products coming from varied and different methods of face and end gluing are tested under uniform procedures and the results are compared to values set forth in established standards. Checking by statistical methods then proves or disproves a process for its uniform ability to achieve the values specified. The laminator generally accepts industry data regarding wood and adhesives, but he must test to qualify the bond produced in his own face and end joint gluing process to determine conformance with design standards.

Universally in the industry for evaluation of face gluing are the standard ASTM block shear test and ASTM test D-1101-58 for accelerated aging. Since there are many different methods for processing end joints, basic research should first establish the value of a specific scarf or end joint and determine that the process is capable of consistently producing the joint tested. These tests may be used for scarfed end joints; however, the aging test would not apply for non-waterproof bonds.

The problem here is that in neither of these tests is the stress applied to the glue line in the same manner as





Breaking a scarf joint in a torsion test (above). At the right is a broken joint showing practically all wood failure which indicates a good bond. The joint on the extreme right shows excessive glue failure which was probably caused by pre-cure or inadequate pressure.

it will be in design loads. Finger joints and others present special problems. There is a need existing today in the industry for a uniform method of testing and evaluating end joints.

One solution might be found in using a tension test, similar to ASTM-D-143-52, which is used for testing lumber in tension parallel to grain. This method is successfully used for testing scarfs in nominal 1 x 3 specimens, which were necked down to ¼ x ¾-inch section size in the area of the scarf joint. By using 1 x 3 control pieces cut from the same original board, the results compare the value of the joint with both the value of the solid wood and design strength.

Alternate Method

A similar method for testing in direct tension parallel to grain has been used with promising results by L. M. Selbo at the Forest Products Laboratory in Madison. The samples cut from the scarf area are 3/32-inch x ¾-inch x 4 inches long and have uniform cross-sectional shape throughout the length. The test load is tension parallel to grain. Other methods have been proposed and used to a limited extent but have not aroused enough interest for this purpose.

In some cases, the finished product is checked by examination of 5/32-inch diameter cores extracted by an increment borer driven into the member in a direction perpendicular to the plant of the glue line. Some indication as to the quality of glue lines can be observed from these cores; however, the size of the area observed is small and this test would only constitute supporting information, not conclusive data.

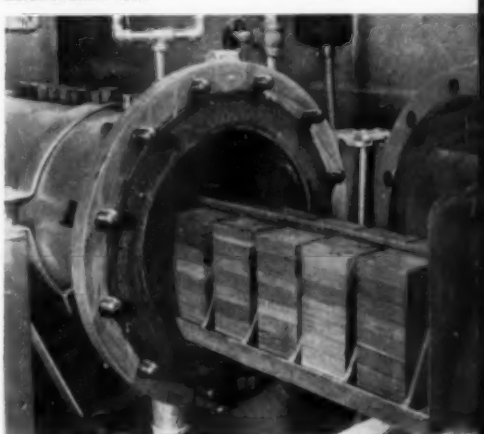
In testing the finished product, there is definite need for further procedures that might be adopted as uniform for the industry. Increment cores large enough to allow measuring of the shear value of the glue line —but not exceeding the size of allowable defects—might be of considerable value. In the search for more comprehensive, non-destructive structural tests, possibilities exist in supersonic flaw detection, or perhaps an adhesive additive that would provide selective influence on some activating media.

The first requirement for attaining structural adequacy in a laminated member is lumber which has the strength to satisfy the design. Lumber testing is not a normal procedure in the production of laminated members, but proper selection accomplished by visual inspection and grading is necessary to assure that all lumber meets the structural standards represented by the grading rules. Each piece must have the necessary percentage of good wood in any cross-sectional area. Defects are considered equally effective throughout the piece, and there is no tolerance permitting a percentage of pieces not meeting the strength requirements of the grade.

When the lumber is ready to enter the production process, the first test run is the determination of moisture content. This is ordinarily accomplished with instruments that indicate the amount of moisture present by electronically measuring its effect on electrical resistance or on an electromagnetic field. Lumber going into the

A potentiometer connected to thermocouples in glue lines is shown being used to check on cure's progress.

Laminated specimens are inserted in autoclave for the ASTM D-1101 delamination test.



product must be controlled at the required average moisture content; the control should be such that the gradient throughout the finished member does not exceed five per cent. The need here is for a universal method of selecting lumber to control both the average moisture content and the gradient.

Two Industry Problems

Two other problems facing the industry in lumber selection are worthy of considerable search for dependable solutions. One is involved in the grading of lumber to be used where working stresses require a given density determination. Visual inspection and current grading procedures have proved ineffective for adequate control. As long as density within a species has an influence in establishing working stresses, there is a definite need for more accurate determination to grading procedures.

The second problem is finding a method for quickly and positively identifying timber breaks or areas in the wood where the wood fiber has been damaged by compression or tension failures that apparently occur when the tree falls. The occurrence of these defects is quite frequent and it is easy to miss them in ordinary grading practices.

The evaluation of adhesives received from the supplier is as important as lumber selection. Industry standards for structural adhesives presently require conformance to the military specifications MMM-A-125 for casein and MIL-A-397 for waterproof resin glues. Performance requirements in these specifications are based on use with white oak, hard maple, and veneers.

This creates a number of problems since the lumber used in the structural laminating industry is predominantly soft woods. The laminator, therefore, tends to accept the certification of the supplier for conformance to adhesive requirements and makes his own examination by testing with the species he is using and under actual plant conditions. The need of the commercial laminating industry is for the development of complete adhesive specifications that will not be affected by changes and specialized needs of military procurement. This would encourage the adhesive manufacturers to direct more of their development work on adhesives for this market.

When a fresh shipment of casein glue is received, the laminator initiates a record of performance data and identifies the shipment with the manufacturer's batch number. A check is made on the glue's working life in accordance with procedures set forth in specification MMM-A-125. Block shear tests are made in accordance with this specification or ASTM D 905-49 except that the hard woods specified are replaced with the specie of lumber that will be used in production.

Minimum performance data for these tests may be found in the standards of the American Institute of Timber Construction or in Bulletin 1069, published by the Forest Products Laboratory. Viscosity is checked and the batch record marked with any desirable change in the amount of water used in the mixture to bring the consistency of the mix to that which is best suited to the process.

One of the problems inherent in the use of casein glue is the variability in viscosity from batch to batch. This necessitates some means of control to assure proper glue spread. In general, these procedures are adequate and create no serious problems for the laminator. There is a need, however, for a soak test to use with the regular shear blocks to determine water resistance. The standard veneer specimens do not represent the conditions involved in structural lamination.

"... these products ...perform primarily in the protection of life and property."

Waterproof resin adhesives are examined to see that they conform to MIL-A-397 and to any specific requirements of the laminator's process. A pot life test of each batch is made with controlled temperature made with controlled temperature for comparison with the specified requirement of the adhesive. In addition, a pot life test is ordinarily made without any control of exotherm temperatures. This indicates the adhesive's adaptability to the specific process and is useful in scheduling the gluing operations.

Samples from each batch are also submitted to accelerated aging tests for evaluation of durability. The procedure most commonly used is ASTM test D-1101-58. However, there are several modifications of this procedure which shorten the time required and appear to give equally dependable results. There is a definite need for a uniform procedure that might be completed within a period of 24 to 48 hours, with accurate results.

All of the above procedures result in data expressed by numerical values, which may be compared to standards of performance. They are essential to the industry in esablishing uniformity in standards.

Production testing — sometimes termed "in line testing of production" —is the most important category as far as the laminating operation is concerned. It permits comparison of representative samplings of daily production to specified standards. These tests must be quick and economical, so as not to interfere with production processes, and, more importantly, to give results which can be interpreted and applied immediately to production quality control.

The tests are generally designed to indicate a minimum of performance that equals or exceeds the value specified in the standards. Since evaluation in terms of specific figures is not required, the tests have become somewhat empirical, as they are based on experience and their effectiveness is dependent largely on the skill and judgment of the operator.

Tests are included in routine procedures for the measurement of glue spread. Accurate determinations are made by weighing a sample piece of lumber before and after spreading with adhesive. The results are computed into terms of pounds per thousand square feet of glue line area. Another method is to weigh the adhesive deposited on a piece of paper of known area. The paper goes through the glue spreading operation on the face of the member and is subsequently weighed. Adjustments are made to account for the thickness of the paper.

Clamping Systems

In most cases, pressure is applied by clamping systems that operate by means of threaded, screw type bolts or rods, with nuts and pressure plates. The test for adequate pressure is ordinarily accomplished by placing a compressometer in a typical package. A torque wrench determines the actual amount of torque necessary to

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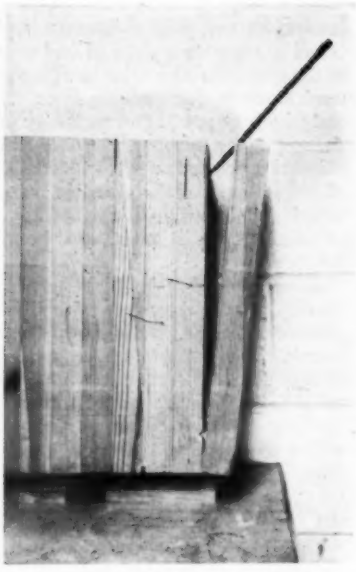
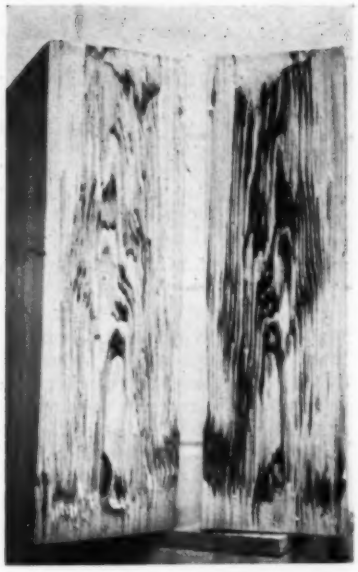
Standard block shear test specimens indicate value of bond in terms of percent wood failure and shear strength of joint in psi.



A wedge or chisel is driven into the glue line of a beam section to cause separation. This is a relatively simple test.



Surfaces exposed by wedging open a beam glue line show practically all wood failure and indicate that the bond was adequate.

produce the required pressure on the compressometer gage. When the clamps are tightened on the glued assemblies, the final turn or two is done with a torque wrench so the actual pressure under the clamp is known.

Must Be Representative

The accuracy of this method is dependent upon the general condition of the screws and clamping paraphernalia. It is essential that the test setup is actually representative of the clamped package when the requirements are determined. A much needed improvement in the gluing operation might be found in the development of an air-operated impact wrench that would automatically cut out when the desired torque is reached.

In a typical laminating operation, there are certain required procedures which are closely related to in-line production testing, but are most often considered functions of production control. Several of these should be mentioned.

Scarf joints are examined for accuracy of form and machining by both visual inspection of the surfaces, and measurement with square and micrometer. Mating pieces are checked to assure intimate contact of the surfaces to be adhered without interference to full pressure over the glue area.

When resin glues are being used, control of glue line temperature for the curing cycle is an important function of production control. Ordinarily a heated chamber or some other type of heating system is used to maintain ambient conditions about the clamped assemblies to induce elevated temperatures in the glue lines for proper polymerization. During assembly of the clamped packages, expendable thermocouples are inserted in innermost lines at strategic points for determining temperature with a potentiometer. These readings are recorded at regular intervals throughout the curing cycle, and they become a permanent quality control record.

The working life of both resin and casein adhesives is affected by the temperature and relative humidity in the gluing room, as well as by the temperature and moisture content of the lumber. Measurements of these conditions are made so that adjusting assembly time can be adjusted to remain within the effective working life of the glue.

After assemblies are completely cured, a number of different tests are used to determine the integrity of the glue bonds. Two methods are used for gluing end joints. One method is to apply the glue, position the joint, and clamp it integrally for curing with the whole clamped assembly of full length laminations. The other is to glue the end joint separately. After the glue has cured, the lamination is surfaced full length, with the face gluing being a separate operation.

The problem in testing completed end joints is to get samples that are representative of a production run. While this is relatively simple when the end joints are pre-glued, it presents many difficulties when the joints are glued integrally.

Obtaining Sample

It is rarely possible to get a test end joint from the end trim of a completed member. Therefore, a sample assembly is generally made at the same time the main member is being put together. The glue spread, timing, and cure can be controlled to closely represent conditions in the product. However, the pressure is influenced by variables surrounding each individual joint and therefore might be questionable, as far as its representation of all other joints is concerned. The thickness of the lamination in the area of the end joint is critical and must be precisely controlled to assure pressure.

Several methods are used for testing end joints. They are all designed to stress the glue joint area somehow until it has completely failed. Evaluation of the glue joint is made on the basis of how much failure occurred in the wood or glue. One method of

doing this is commonly known as the torsion method.

Test pieces are sections of full size laminations long enough to have a full size scarf joint in the center with enough material left on either end to allow clamping outside of the scarfed area. One end is clamped in a fixed position and a lever applied on the other end in such a manner that it may be twisted so that the scarf is opened up or the wood of the specimen joint is broken.

Another method uses approximately the same test piece except that it is positioned to function as a simple beam in a device that loads it at third points until complete failure occurs. Evaluation of the glue bond is the same as above. Occasionally the standard ASTM block shear test is applied to end joints; however, due to the difficulty in preparing representative samples, it is not often used for production testing.

Representative Testing

The major problem in end joint testing is in securing representative sampling for statistical controls. A second problem is involved in applying the destructive load to the test samples in a manner which places the major portion of the stress at the glue line and of sufficient magnitude to assure that the amount of wood failure is actually indicative of glue line strength. The usefulness of these procedures is dependent on operator skill and experience as a technical background is essential to interpretation of the test results.

Glue line strength testing in the face bonding of the member is accomplished by the ASTM block shear test in most plants. In some cases, laminators use only a hammer and chisel to separate a piece of end trim at the glue line. The value of this test used alone is questionable since the end trim may not be representative of the rest of the member. However, the chisel test provides a good indication of the strength of the glue line being tested and is a valuable *supplement* to other testing in most wood bonding operations.

After a member is completely assembled and fabricated, visual inspection discloses evidence of process integrity and should be a routine quality control procedure. In a laminated member properly produced, the glue lines will have a thickness within the range of .003 to .009-inch. Openings in glue lines will be infrequent and extend only slightly into the piece. Seasoning checks in the wood will be slight and any occurring adjacent to glue lines will disclose separation of wood fiber as well as glue.

Deviation from these conditions is not conclusive in the matter of structural adequacy. Before certifying a member's conformance to standard a study should be made of its production record to determine whether all processing requirements were met.

Routine testing is also essential on certain items of equipment and instruments used in production controls. Torque wrenches do a critical job in the laminating process. At best they are rather fragile and need constant care. Testing facilities should be provided for routine verification of their calibration or they should be sent to a laboratory for testing and adjustment. There is need in the industry for the establishment of a uniform procedure for wrench calibration.

Moisture meters of the electrical resistance type often lose their accurate calibration or become erratic in their operation without giving any warning that the readings are improper. Therefore, it is essential that routine testing be done by comparing meter readings with oven dry tests to assure proper calibration.

There is considerable room for improvement in the measuring and control of moisture in lumber and in laminated beams. The instruments which indicate the amount of moisture by measuring the electrical resistance between needles inserted into the wood are not practical for continuous production line checking and readings are limited to relatively small sections of the piece. When equipped with insulated needles, however, these instruments properly used will accurately indicate the over-all moisture content and the gradient of the sample.

Moisture Distribution

Electronic meters generally indicate an average moisture condition in an area but do not indicate the nature of a gradient that might exist in the moisture distribution within the piece. In many cases, the evaluation of moisture meter readings is influenced by the operator's knowledge of the drying procedures used on the lumber and his experience with materials previously received from the same source. It is obvious, therefore, that there is a need for unifying industry procedures with a method that uniformly measures moisture conditions with the accuracy requisite to the product's needs.

Probably, the most serious problem facing the industry today is to enforce continuous and conscientious usage of the methods currently available to assure a uniform product of top quality. Raw materials are not specifically designed and graded for individual operations and must be continuously qualified, especially the lumber for strength and the glue for quality and working characteristics. The variables inherent in both make mandatory an adequate system of quality control in all phases of a laminating operation. Adherence to established standards and the use of these procedures by skilled operators to measure conformance will assure a product of superior integrity.

The above article is based on a talk given at the 1960 Spring Conferences of the Building Research Institute.

About the Author . . .

RAYMOND E. WIRTH is a member of the executive staff of Rilco Laminated Products, a division of Weyerhaeuser Co. He has been with Rilco since 1942. A member of the American Institute of Timber Construction's Technical Committee, Mr. Wirth received his bachelor of arts degree from Morningside College, Sioux City, Iowa.

Pressure-Sensitive Tape Helps Catch USAF Space Capsules

Tape provides for time lapse needed to assure that the falling capsule has been caught in grappling hooks

Pressure-sensitive tape is applied by C-119 crew member as he holds one of the hooks to a boom.

Space capsules falling from the sky are being caught with a helping hand from pressure-sensitive tape.

According to a report from the U.S. Air Force's 6594th Recovery Control Group, a crepe-paper masking tape is being used to hold in place the big metal grappling hooks that snag a falling capsule's parachute. The tape breaks just in time to enable the capsule to be reeled rapidly into the moving airplane.

Recently the tape technique was used to help catch the space capsules of the Discoverers XIV and XVIII satellites near Hawaii. Performing the catching operations were C-119 crew members attached to the 6594th Control Group, stationed at Hickam Field, Honolulu.

Extensive Testing

The tape—Scotch brand No. 202—was selected after extensive testing to find a material that would work in perfect timing with the precision technique developed to pluck a satellite capsule—falling at 1600 feet per minute—from mid air and bring it safely into the crew's hands. It is used to hold two heavy hooks and a nylon rope harness to the base of two metal booms extended from the C-119.

Tests showed that the .0075-inch tape consistently broke in time to allow a powered winch to pull the hooks and harness into the plane with their catch. It also allowed just enough of a time lapse to enable the harness—dangling from behind the plane—to ensnare the capsule in its large loop.

In pre-flight preparations, the two-inch wide tape is wrapped several times around the stem of the hook and the base of the boom to hold them tightly together. It is positioned to hold each stem and its attached harness rope approximately one inch from the end of each boom. A third hook is also secured by the tape but is positioned on the center rope of the harness, far enough from the boom so that it cannot interfere with the reeling.

Secured Hooks

Once the hooks are set securely in place, the 32-foot booms are extended from the cargo doors during flight. The booms are positioned behind and under the plane. They move and draw with them the entire rope harness which falls below to form the catching loop. Instant pressure brought by the sudden weight of the capsule and dragging parachute breaks the tape.

Made from a 20-pound white crepe-paper stock, the tape is a product of Minnesota Mining and Manufacturing Co. It has a tensile strength of 18 pounds per inch of tape width and a flexible treated paper backing with a ten per cent stretch at break point. Its adhesion to steel is 30 ounces per square inch of its width, making it capable of firmly holding the bronzed four-pronged hooks to the stainless steel booms during the entire time needed to search for the small falling capsule.

According to the Air Force, the trailing harness resembles a flying trapeze which hangs in mid air during flight—like a trap waiting to snatch the capsule the instant the hooks stop, the chute.

Air Force officials point out that though the taping is just one of many details of the spectacular operation, it plays an important part in its success.

Taped hooks and booms are extended from cargo doorway to suspend harness behind and below plane.

Adjusting center rope of harness. V design of floor edge (arrow) facilitates reeling in the rope.

Testing Adhesives for the Vulcanized-on-Sole Process

An extensive adhesives study reveals that proper roughening of the uppers is the best way to insure a good leather-to-rubber bond

By A. W. NICONCHUK
United Shoe Machinery Corp.
Beverly, Mass.

As part of an investigation into the possibility of producing water-resistant footwear by molding rubber soles directly to uppers specially treated with silicone emulsion, a United Shoe Machinery research team made an extensive study of adhesives that might lend themselves to this process. The job proved to be far more involved than anticipated, due to the number of variables involved in the process.

For example, the following eight factors had to be taken into consideration:

(1) Variety of soling stocks used and contemplated in the future.

(2) Variety of leather used in shoe uppers and contemplated for future use.

(3) Non-availability of a universal adhesive suitable for all types of soling materials.

(4) Variety in shoe-making procedures: wide versus narrow lasting margins, heavy pleats around toe, etc.

(5) Variability in preparation of shoe uppers prior to adhesive application.

(6) Lack of descriptive data on an adequate bond for the molded-on process.

(7) Inadequate test methods.

(8) Need for fast-curing adhesives.

To the best of our knowledge, there is no universal adhesive that will provide adequate bonds for all types of soling compositions. Such an adhesive is conceivable, however, and an approach to such versatility appears to be formulations of the isocyanate type.

Many claims to versatility exist in adhesives, but we were unable to confirm such claims. Since the molded-on process is still in its infancy in America, it is difficult to predict whether a single adhesive will be developed that will adequately bond all types of soling stocks and upper materials.

Our adhesives study revealed that adequacy in preparation of the upper is extremely important. Proper roughing is perhaps the greatest single factor for insuring a good bond between leather and rubber. The ideal condition exists when the shoe upper is roughed to the mold bite line. This procedure removes the finish and grain surface, exposing the fibrous part of the leather.

Leather roughed at high speed becomes hard and non-receptive to adhesive penetration. Methods of roughing were not investigated by our laboratory research team. However, we did investigate bonding to a grain surface from which the finish had been completely removed. Although we were able to bond to the grain surface of the leather, the bond strength was only as strong as the strength of the thin layer that constitutes the grain membrane. This bond strength, of course, is very poor.

The width of the lasting margin and the flatness of the wrap-around at the toe constitute other important factors in good bonding. For example, heavy pleating in the most critical toe area minimizes contact between the rubber and the adhesive. In addition, valleys of the pleats cannot be roughed free of finish and no adhesive tried will adhere firmly to the leather finish.

Our adhesives study was complicated by lack of a definition of adequate bond for the molded-on sole. One approach to the problem of laboratory evaluation of adhesion bonds is the Satra tester. While simpler and more convenient than other methods, the basic problem of relating laboratory test data to actual wear tests was still evident. However, since wear tests are extremely time consuming, any method which provided relative comparisons would prove a valuable laboratory tool for the planned investigation.

The Satra tester shown in Figure 1 operates on a simple leverage principle. The shoe, with last inserted for rigidity, is positioned so that extension of the sole at the toe area fits snugly under the spring-loaded contoured clamp. A stationary piece forward of the clamp acts as the fulcrum.

Pressure exerted downward on the heel end of the shoe exerts an increasingly greater upward pressure on the spring-loaded holding clamp. This pressure, read directly in pounds force on the dial indicator, represents the force necessary to break the sole away from the upper.

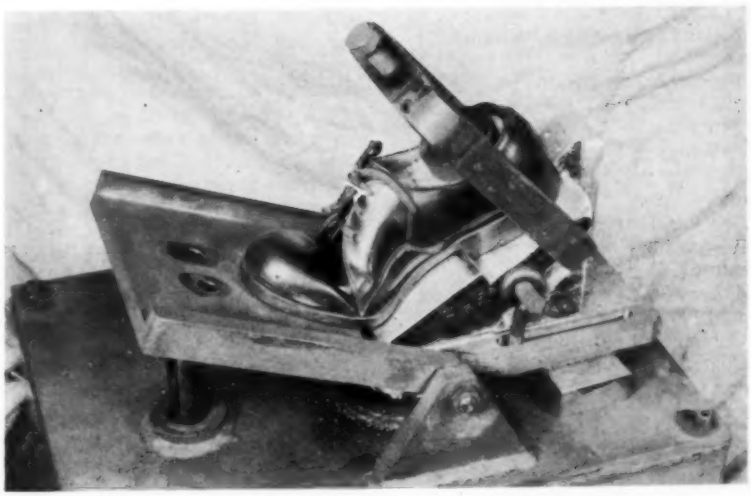
The Satra is provided with a smaller holding clamp for the heel. The shoe is simply reversed and a similar reading of bond strength is determined for the heel portion of the molded-on bottom.

Laboratory strip test and Scott tensile test methods proved extremely

The Satra tester, right, uses a principal of simple leverage. Firmly attached soles have registered 150 pounds with no break.

The "Torture Flex Tester" shown in center of column is used for effective and quick screening of adhesives used in the process.

Below, rubber bottoms are compared with worn leather uppers after 13 months, left, and six months of wear in a field test.



valuable in screening adhesives, types of leather, and soling stocks.

Figure 2 shows the "Torture Flex Tester" designed and developed by United Shoe Machinery personnel. The forepart of the shoe flexes by means of a vertical push-rod arrangement. The platform contacting the sole is usually knurled to hold the sole stationary.

Simultaneous with forepart flexing is a twisting action accomplished by a cam mechanism through the locked-down heel. Considerable force is exerted at the ball line of the shoe causing rapid failure to inferior rubber-to-leather bonds. This machine can be used effectively for screening adhesives quickly.

We did not have a positive test method for determining the bond strength between the vulcanized-on-sole and the shoe upper. Therefore, we accepted as evidence of a suitable bond the cohesive failure of the rubber, leather upper failure, or both. Firmly attached soles have read 150 pounds—the maximum of the Satra tester—with no break at the toe tip.

Throughout the adhesives study, we found that thermoplastic type adhesives such as non-curing rubber cements, vinyl cements, and resinous cements were inadequate for the molded-on process. These adhesives showed poor hot bond strength and as a result the sole would be dislodged when the finished shoe was removed from the foot form. The only exception to this was when B.B. Chemical Company's 675 Neoprene Cement was used with a particular type of American Biltrite neoprene soling stock.

Thermosetting type adhesives

proved far superior. Our heat conductivity study revealed that the thermosetting adhesives must be very fast curing. However, since fast-curing adhesives have limited shelf life, they must be prepared as two-part systems. One part contains the sulfur portion while the second part contains the accelerator portion.

Our investigation of adhesives and bonding was conducted primarily with ACL Keena leather of HH weight and an oil content of seven to eight per cent by weight.

The majority of wear test shoes were made with this type leather. Other leathers used in wear test shoes included: (1) ACL Fina, (2) ACL Melgo, (3) ACL Glasco, (4) Sylflex, Dow Corning Process, and (5) Trostel vulcanizable leather.

The general characteristics of adhesives found suitable for process use were shown to have the following characteristics and features:

Type: Thermosetting, vulcanizable type.

Viscosity: 2 to 10,000 cps.

Cure Time: 10 minutes or less at 230°F.

Stability: 8 hour pot life when mixed, no gelling of base component.

Solvent: Fast drying solvent system (one hour or less at room temperature).

Other: Base material and solvent should be non-toxic for normal use.

Commercial adhesives which were evaluated and found satisfactory for process use with laboratory soling stocks are:

Adhesive	*Soling Stock*
BB 4903-8 A&B	1296-38-1 Natural
BB 4903-8 A&B	1327-17 Butadiene-Styrene
BB S47-36	1322-15-5 Nitrile
BB S47-36	1322-25-1 Vinyl-Nitrile
BB 675	American Biltrite Neoprene

Some 75 pairs of work shoes and an equal number of children's shoes were issued for wear test data. The work shoes were distributed among personnel in various industries for optimum evaluation. The children's shoes were confined to orphanages.

Of the work shoes on test, only one pair showed premature failure and this was due to adhesive failure at the rubber-leather interface. All others showed leather upper failure.

There was some evidence of upper failure due to welt plate damage, but in most instances such damage was accompanied by general cracking of the leather upper in the vamp area. The severity and time element of failure of uppers depended upon wear test environment such as pickling plants (fast), construction (intermediate), and indoor (slow).

As a result of the study, the following conclusions were drawn:

(1) To the best of our knowledge, there is no universal adhesive available commercially that will adequately bond all types of soling stocks to the variety of leather used in shoe uppers.

(2) The best adhesives for the molded-on process are thermosetting types.

(3) Thermosetting adhesives must be sufficiently fast curing to set during the curing cycle.

(4) Maximum bond strength results from shoe uppers with wide flat lasted margins that are roughed to expose the soft, fibrous layer of the leather.

(5) Molded soles which are slightly undercured nearest the adhesive layer show good initial bond strength. Effectiveness of such a bond under actual wear test has not been determined.

(6) The degree of adequacy of bond strength between rubber and leather has not been determined. Our wear test data indicate adhesives used were highly satisfactory.

(7) A variety of leathers have been successfully bonded to various soling stocks, and have performed well under actual wear test.

(8) Two coats of adhesive, with adequate drying intervals, result in the best bonds.

(9) Adhesive viscosity should not exceed 4,000 cps for good leather penetration. A thinned down first coat is preferable for best bonding.

About the Author . . .

A. W. NICONCHUK heads United Shoe's research team in shoe process and allied studies. From 1946-56 he did textile research for Dewey and Almy Chemical Co.

Adhesives Solve High-Speed Polishing Problem

A super-strength bond between the rubber "tire" and the metal hub of polishing and grinding contact wheels now prevents explosive failures during high velocity operation.

Extreme speeds permit faster polishing and superior finishes on high-finish hard goods such as electric frying pans and jet blades. These products call for polishing speeds of from 1800 to 19,000 rpm, depending on the wheel size. At such velocities, the tremendous centrifugal force can produce dangerous sudden failures of the wheel's rubber-to-metal bond.

Chicago Rubber Co., Inc., Waukegan, Ill., a leading producer of rubber contact wheels and rolls, has solved this problem through use of an adhesive system which bonds uncured elastomers to metal with a rubber-tearing bond. The system is based on Chemlok Adhesives 220 and 203, products of the Hughson Chemical Co., Erie, Penna. One coat of 203 is used as a primer and one coat of 220 as adhesive for both stainless steel and aluminum hubs.

An electric frying pan producer using these Chicago Rubber wheels reports that the velocities these bonds make possible have improved the finish of the utensil and cut polishing time per pan from three minutes to 42 seconds.

The Chemlok adhesive system can be used with a broad spectrum of elastomers and permits wide manufacturing tolerances.

How the Straight-Edging Ripsaw and the Clamp Carrier Facilitate Lumber Edge Gluing

There are two imperatives in efficient edge gluing of lumber components for making up various types of wide dimension board: a suitable method for making edges to be joined perfectly straight and sufficiently smooth to provide a really good joint when they are clamped together; clamping equipment to bring all the glue-spread joining edges into intimate contact, and hold them there while the adhesive sets and the bond becomes effective.

There are certain equipment variations for both these steps, however. Of particular importance and popularity are the modern straight-edging ripsaw for making initial joints, and the time-honored clamp carrier for clamping up wide plates. This latter equipment is particularly suitable for use where room temperature setting adhesives are employed. The ripsaw and clamp-carrier combination, therefore, is one extensively employed in the woodworking industries.

Before development of the modern straight-edging ripsaw, there was no possibility of gluing edge joints direct from the saw as available ripsawing equipment did not provide sufficiently straight edges. After preliminary ripping, it was necessary to route the material over some type of edge jointer (often a so-called glue jointer) for further straightening and surfacing of the edges before sending them to the clamp carrier.

In recent years, however, carefully engineered straight-edging, overcutting ripsaws, have provided edges of such smoothness and straightness tolerances, that edge gluing direct from the ripsaw has become a fairly common practice.

A prime reason for many production executives turning to directly-ripped glue joints, rather than continuing to employ a glue-jointing machine between the ripping and edge-gluing operations, is that a certain amount of lumber is saved by ripping glue joints directly. In addition, both labor and an extra investment are saved through eliminating an intermediate jointing operation.

Saw blades used on straight-edging equipment are quite often termed "glue joint" saws. They are made for ripsaw unit manufacturers by companies specializing in high quality saw-blade production.

The glue joint ripping operation is quite highly standardized. Consequently, a standard saw blade has been made for the purpose by some manufacturers. Generally, it is 12 gage, 14 inches in diameter when new, and is tensioned for 3600 rpm. This is the speed used on modern ripsaws of the straight-edging type—such as those made by Mattison Machine Works—because they employ a directly-mounted motor running on 60-cycle current.

30, 32 or 36 Teeth

A standard saw blade of this kind may be obtained with 30, 32 or 36 teeth, but the 30-tooth blade is often preferred. A heavier-gage blade can be ordered at a somewhat higher price if desired. However, a 12-gage ripsaw with 30 teeth, tensioned for 3600 rpm, makes a perfect glue joint on either hard or soft wood, whether the teeth are spring set or swaged.

Where swaged blades are used, the teeth are swaged and shaped in the standard manner, but are also side dressed. Side dressing insures uniformity in width of shaped portions of *all* the teeth so that they will track in precisely the same path on the sides, providing the necessary smoothness of cut.

Straight-edging ripsaws used for this purpose are often fitted with special jointing attachments by means of which the saw may be jointed perfectly round, and sides of the tooth points may be dressed directly on the arbor where the blade runs and rips lumber. Using this method guarantees that there will be no variation in the running path of different teeth during operation.

The secret of perfect straightness obtained on a ripped edge in this manner is combined use of a single feed chain, running in the ripsaw table, and a set of pressure rolls, directly above this chain. The pressure rolls are spring tensioned and function to hold the stock firmly to the chain while the material travels through the machine.

The feed chain is made up of a series of one-piece links or blocks, with hardened, corrugated top surfaces, which function to prevent any lumber slippage on the chain. The under side of each of these links or blocks is accurately machined with two female vees—positioned near the two edges of the chain—so as to provide two continuous female vees all around the underside of the chain.

The female vees fit upon and run over two corresponding male vees, which they fit precisely. The male vees are provided on a special hardened, wear-resisting track, which is cast and machined as a unit, then mounted directly on the ripsaw base in a machined groove.

These male vees are perfectely straight. Because the pressure rollers above function to hold the lumber tightly down on the running chain, and the running chain, in turn, has its female vees held in snug contact with the male vees of the track, there cannot possibly be any deviation from straight travel. Hence, the perfectly-straight joints obtained.

One of the earliest methods of clamping up edge-glued lumber was the use of plain bar clamps, adjustable for length through a considerable scope. After edges to be joined were spread with adhesive (which was practically always animal glue in

those early days), bar clamps were applied at intervals along the length of the plate being glued up. These clamps were alternated so that half of them were placed over the top of the stock and half along the underside. The material was held on two or more trestles.

Clamp alternation was necessary to prevent buckling. After the assembly was adequately clamped, it was removed from the trestle and taken to an adjacent storage point to free the trestles for clamping up the next assembly.

The combined weight of the assembly and clamps was often great, and the operation was, therefore, very fatiguing. There was no escape from manually handling the combined clamps-and-plate assembly.

The so-called clamp emerged as a highly-efficient method of eliminating the excessive manual labor involved. Due to its great versatility and productivity, it has been popular ever since. Operators of this type of edge gluing equipment stand in one place, and practically no stooping is involved.

As soon as one station of a clamp carrier has been filled with freshly-glued stock, both the stock and the clamps are carried away by the machine, practically without effort on the part of the operator. The bondant sets either in whole or in part while the stock is making a circuit of the mechanism. After making the complete circuit, it is automatically delivered back to the point where it was first inserted in the clamps.

On larger clamp carriers, the operation involves taking dry material out of each station or set of clamps in the carrier, replacing it with freshly-glued stock, advancing the mechanism one station, and repeating this operation continually.

Clamp carriers are well adapted for edge-gluing material direct from the ripsaw, although they are also employed for edge-gluing jointed stock. Special quick-setting glues can be used in connection with clamp carriers—if one obtains a definite production advantage by so doing.

Two types of clamp carriers are generally employed. Where smaller amounts of material are to be edge glued, a revolving-wheel type is used. On such a carrier, all sections radiate directly from a revolving shaft or drum, the shaft being held in bearings held on standards at a consistent height above the floor.

Caterpillar Carrier

The other type of clamp carrier is the so-called caterpillar or traveling-chain carrier which can handle practically any volume. On such a machine, all clamp sections travel to and from the operator horizontally.

Although wheel-type carriers are limited in production volume, some manufacturers, like Black Brothers, build them with 8, 12 or 14 sections. Whenever more than 14 clamping sections are needed, a traveling-chain machine should be used. The caterpillar type of clamp carrier may be long or short, depending on capacity required. It is generally better to purchase and install one clamp carrier of the traveling-chain type than to use more than one of the wheel type.

The usual run of stock edge-glued in a clamp carrier is 4/4 and 5/4 material, edge glued to desired widths. Thicker stock can be bonded with so-called thick-stock clamps, whenever this is found desirable in a given plant.

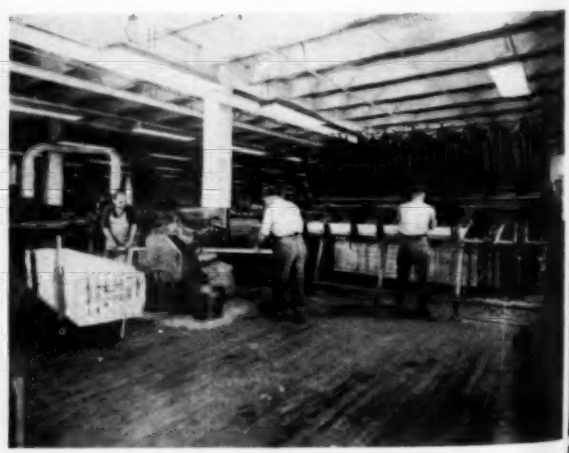
The longest material edge glued in any specific plant can be easily determined. This provides the necessary key as to the *width* of clamp carrier one should install. Work glued up in a carrier may be either in a single course, or in more than one course—provided working width of the carrier is sufficient to accommodate more than one. For example, with a carrier approximately 16 feet wide, one can glue material 16 feet long.

When necessary, full use can also be made of the capacity of each clamp section by gluing up combinations of lengths which will utilize the clamping space available. Thus, if a large run of eight-foot or six-foot material were being glued, two courses would be handled all the way down the line on a 16-foot carrier.

On many of the better clamp carriers, ball bearings are used throughout. A rest—swinging type gate—is provided at the operator's station and is pulled forward to allow clamps to clear as the traveling mechanism advances. This swinging gate or rest automatically returns to vertical position when released.

It might be mentioned that the revolving-wheel type of carrier has occasionally been found to incorporate *one* advantage over carriers of traveling type: they can be built with sufficient strength to glue excessively long material.

View of setup at Morgan Mfg. Co., Black Mountain, N.C., shows a battery of ripsaws which have been equipped with a saw-blade jointing device. (Photo courtesy of Mathison Machine Works.)



The 90° clamp carrier shown above is used for carrying thick stock. Note the resilient-roll spreader at the loading point of the carrier. (Photo courtesy of Black Bros. Co., Inc.)

The central shaft used, particularly, on certain revolving carriers, is tubular. This center tubular member is increased in diameter, proportionately, as wider revolving carriers are built.

Some exceedingly wide carriers of this type have employed a center tubular member as great as 24 inches in diameter. By this means, revolving carriers as wide as 22½ feet, capable of gluing material 22 feet in length, have been made. A large diameter tubular member of sufficient wall thickness will defy deflection over long spans while holding weight down to the lowest practical minimum. This equipment provides a dependable method for edge gluing long heavy material with perfect assurance that it will remain straight.

Carriers of endless-chain type as made by Black Brothers Co., Inc., are available in two different styles, the difference having reference to the angular opening provided between sections at the loading point. One style incorporates an angular opening of 60° between sections; the other provides a 90° angular opening. However, the 90° machine is chiefly valuable in reference to thick-stock clamping, rather than to gluing 4/4 and 5/4 material.

Machines of this type are supported by unbreakable all-steel frames designed to meet requirements of the particular carrier on which they are used. Because ball bearings are used throughout, such carriers *may* be easily turned by hand, to advance them from station to station. However, a reversible motor drive, generally employed on such carriers, is strongly recommended.

This motor drive is controlled by a drum reversing switch, mounted on the front rest of the carrier. A switch handle is readily accessible to the operator. He pulls this handle upward to move the freshly-loaded carrier section up. Conversely, when he depresses the switch handle, the carrier will move down. Whenever the operator releases the switch handle, it automatically moves into neutral position, stopping the carrier.

These clamp carriers make use of a draw-screw type of bar clamp, which means that the clamp screw is in tension while pressure is on the work. This is far more efficient than using clamp screws in compression, as has so often been done. Actually, it is employment of the draw-screw type of clamp which has made wide use of the clamp carrier economically feasible.

Polysulfide Sculptor's Mold

A cold-setting, polysulfide rubber compound was used recently by a New York sculptor to make a flexible casting mold capable of capturing the complex surface texture of a dramatic clay statue.

Working under a commission from the Seminary of St. Pius X at Graymoor, Garrison, N.Y., George Kratina was particularly anxious to use a casting technique that would faithfully reproduce the multitude of sharp undercuts that contributed to the aesthetic tension of his statue of St. Anthony. He decided to bypass the usual plaster mold process and cast his work from flexible rubber molds which would more sensitively reproduce the original model.

The mold was made for Kratina by Randolph Plastics, Catskill, N.Y., which devised a four-piece laminate built up on the model from layers of Smooth-On FMC compounds, developed by Smooth-On Mfg. Co., Jersey City, N.J. This laminate was allowed to harden in a covering jacket of milled fiberglass, asbestos and thickened polysulfide rubber.

A blast of compressed air between the jacket and polysulfide laminate made it easy to peel off the mold. It was then prepared for casting by scrubbing it with kerosene and washing it down with acetone.

The mold making technique described above is especially advantageous in that it eliminates the tedious process of making multisectional plaster molds. In addition, it is felt that surface textures involving a great deal of detail work can not be as faithfully reproduced by non-flexible mold mediums such as plaster.

A thin layer of polysulfide is applied to the clay model. Formulations of varying thickness were used to build up the mold.

The inner polysulfide layer of the jacket is easily peeled back and removed without loss of any of the intricate details on it.

The finished plaster statue is shown here between two major parts of the jacketed mold from which the casting was made.

High Frequency Curing of Adhesives

Though its major importance is now in wood gluing applications this relatively new technique is beginning to be accepted in other fields

Most of the modern synthetic resin adhesives of the cold setting type go through a curing process which is a function of time and temperature. A typical mix of urea-formaldehyde resin will cure in four hours at a temperature of 70°F. For every temperature increase of 15 degrees, the curing time is halved. The mathematics of this gives a curing time of slightly under 60 seconds at 190°F. and less than 30 seconds at 205°F. Knowing this, it is obvious that if we can raise the temperature of a urea-formaldehyde glue line to 190°F., we can cure the glue in a minute. This might be called artificial curing as opposed to natural curing at room temperature.

There are many wood gluing applications in which glue lines are near the surface of the assembly. A typical example is found in the gluing of thin veneers on a wood or particle board core to make a furniture panel. This type of gluing can be rapidly accomplished in a press with conventionally heated platens. The heat rapidly penetrates the thin surface veneer and the glue line temperature is quickly raised to the required degree so that a fast cure is obtained.

Many assemblies to be glued, however, have glue lines remote from the surface. As wood and most other materials being glued today are poor conductors of heat, it takes minutes and in some cases hours, to cure glue lines by the use of heat applied to the surface of the assembly.

It is at this point that high frequency energy enters the picture due to its ability to generate heat rapidly and uniformly within a mass of homogeneous material. Before demonstrating how high frequency energy cures adhesives let us investigate the phenomenon of high frequency power.

Years ago, a German scientist who was doing experiments involving Leyden jar condensers observed that they became warm after repeated charging and discharging. This was doubtless the first observation of the heating of a dielectric material by subjecting it to an alternating electrostatic field.

No practical use was made of this phenomenon for many years. It was, in fact, a nuisance to the users of capacitors in high power radio transmitters. If capacitors designed for this type of service did not have an extremely high quality, low loss dielectric material then would seriously overheat and become useless.

About twenty-five years ago somebody apparently decided to find out if any good could come from this. He may have taken a board, placed it between a pair of metal plates and applied high frequency alternating current to the plates. If he did follow this procedure, he learned that the board was heated rapidly and uniformly throughout its entire mass.

From this and similar early experimentation has grown an industry devoted to inducing heat within materials by using the material itself as the dielectric of a high frequency capacitor. It was found early in the game that frequencies had to be fairly high—in the order of several million cycles per second—or the material would be ruined by high voltage flash-over before it could be heated.

By HERBERT B. REED
Chief Engineer
Raybond Electronics, Inc.
Norwood, Mass.

For applying high frequency power to the capacitor, we need a source of alternating current and voltage whose reversals of polarity occur anywhere from three to 30,000,000 times per second rather than the 60 times per second used in homes and offices. It is, however, the same kind of power and it follows all the same rules of A. C. circuits as does 60 cycle power.

However, it does not behave in the same way; it only follows the same rules and is bound by the same laws. The formula we use to find the power delivered to the load at a given frequency, voltage and capacity is the standard one for losses in a capacitor. It applies at any frequency, 60 cycles or 6,000,000 cycles. It is:

$$W = E^2 \times 2\pi f \times C \times \text{Cos } \phi$$

In the above equation, W = power in watts, f = frequency in cycles, E = R.M.S. volts, and Cos ϕ is the power factor expressed as a percentage.

In the frequency ranges employed for dielectric heating, mechanical generators are out of the question. Vacuum tube oscillators are used for sources of high frequency energy. In the case of Raybond Electronics, the oscillators are of the tuned plate type. The basic circuit of these units is shown in Figure 1.

We have found this to be the simplest type of high frequency generator in use. It has good stability when components are correctly chosen. It also has a minimum number of parts and lends itself to several methods of high frequency power application, which we will discuss shortly.

"This high frequency generator circuit may be fine," you say, "but

where do you put the material to be heated?" There are two general methods, each applicable to a specific type of work to be done.

For work that presents a moderate electrical capacity and can be done at a low voltage level, we make the tank capacitor variable and insert the load capacitor in series with it in the oscillator tank circuit. For many other types of work, it is necessary to use a separate load circuit containing the load capacitor, a tuning element and a coupling coil which inductively couples the load circuit to the generator tank circuit. This circuit can develop high voltage across a load but under some conditions may be critical in tuning and have inadequate stability.

There are three methods in general use for curing of adhesives with high frequency power:

(1) Mass heating
(2) Direct glue line heating
(3) Stray field heating

The first method is a duplication of the Leyden jar capacitor. For electrodes, we use sheets of aluminum or copper with the material to be glued placed between the metal plates and held under pressure during the curing cycle. An excellent example of this work is found in the production of molded plywood. (See Figure 2).

High Loss Factor

The metal plates and the assembly of veneers and glue make an electrical capacitor, although a poor one due to the nature of the dielectric, wood and glue. Due partly to the moisture present, it has a high loss factor and when high frequency voltage is applied to the metal plates the dielectric of the capacitor heats from the passage of leakage current.

Your next logical question may be something like this: "Suppose I want to make curved plywood panels 12 inches square and one inch thick. How big a generator will I need to produce about 100 of these panels per hour"?

First, get the weight of the panel, which in this case would be about three pounds. Next, we need to find the number of B.T.U.'s required to raise its temperature to 200°F.

$$\text{B.T.U.} = W \times \text{Spec. H} \times \text{Temp. Rise}$$
$$= 3 \times .5 \times 130$$
$$= 195$$

We need 195 B.T.U.'s to cure the panel, but to produce 100 per hour we need 195 B.T.U.'s nearly every 30 seconds, or 390 B.T.U.'s per minute. Now, 57 B.T.U.'s equals 1 K.W. min. so we will need 390/57 or 6.8 K.W./Min. If we add 10 per cent for losses, we find that a generator with an output of 7.5 K.W. will give the required production.

As for frequency, we find it best in most cases to keep it fairly low in order to achieve uniform voltage distribution on the electrode area. To compute a frequency, we must assume a maximum electrode voltage which will not cause electrical breakdown of the material with its resultant arcing and damage to the work. We know from past experience that an assembly of wood and glue such as this can stand up to 4000 volts per inch of thickness.

Now we can re-arrange the formula mentioned earlier for power loss in the dielectric of a capacitor, to determine frequency, thus:

$$= \frac{W}{E^2 \times 2\pi f \times C \times \text{Cos}^* \sigma}$$

W = Watts = 7500
$E^2 = (4{,}000)^2 = 16 \times 10^6$
$2\pi = 6.28$

$$C = .225 \times 4 \times \frac{144}{1} = 130 \text{ MMFD.}$$
$$= 130 \times 10^{-12} \text{ farads}$$

$\text{Cos}\ \sigma$ = Power Factor of Load
$= 10\% = .10$

$$= \frac{7500}{16 \times 10^6 \times 6.28 \times 130 \times 10^{-12} \times .1}$$

$$= \frac{7500}{1306.24 \times 10^{-6}}$$

$$= 5.7 \times 10^6 = 5.7 \text{ mc.}$$

Thus we will use a frequency of about six mc. for this work. True, if we went higher, we could reduce the voltage, but the above limits are safe and the higher we go in frequency the more problems we may encounter from voltage variation and generator components.

In this type of adhesive curing, problems may arise from uneven moisture content in veneers. Those with high moisture content will heat more rapidly and may become so hot that when pressure is released from the cured panel steam is instantly formed and the panel literally blown apart.

A Trouble Spot

Another cause of trouble is uneven veneer thickness which results in a panel of non-uniform cross section. The thinner part will heat faster and may be overheated before other parts are cured. Uneven heating may also be caused by improperly designed forms that exert greater pressure at some particular point on the panel. When the panel becomes heated compression is greater at this point, the panel becomes thinner in this area and consequently overheats.

In the second method, called "direct glue line heating," we use metal plates for electrodes as in the first. They are, however, usually flat. The most common use of direct glue line heating is in the production of edge glued panels for the furniture industry. (See Figure 3).

Here we again have a capacitor with a high loss dielectric. In fact the wet glue lines contacting the electrodes present such a high loss to the flow of current that they are heated very rapidly and at such low voltage (500-1000) that very little heating of the wood takes place.

This gluing is, of course, done in a press in which edge pressure is applied to the boards to be glued. The lower electrode is usually stationary while the top electrode is brought down into contact with the panel as-

About the Author . . .

HERBERT B. REED, chief engineer of Raybond Electronics, assumed his present job in 1955. Previously he had been associated with the Thermex Division of Girdler Corp., the Industrial Electronic Division of Raytheon Mfg. Co., and the Bell Machine Co. He has a patent pending on a carton sealing electrode system.

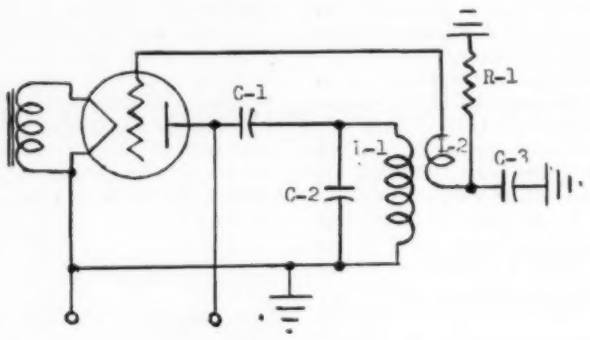


Figure 1

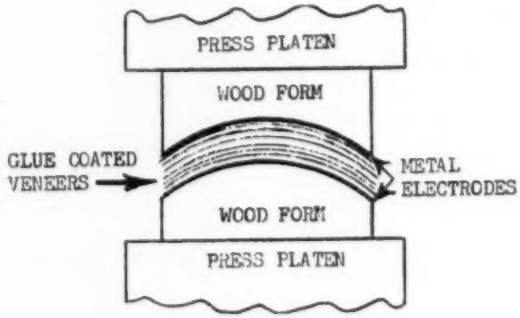


Figure 2

Figure 3

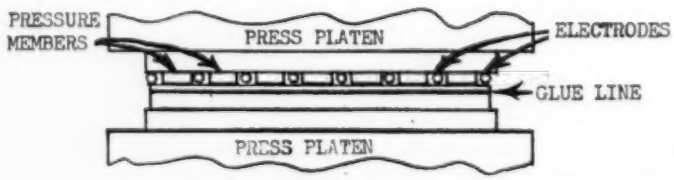


Figure 4

sembly and held there by some pressure means, usually air.

In this application of high frequency curing, we find the previous formulas impractical to apply and revert to empirical methods. Experience has taught us that we can cure 100 square inches of glue line area per minute per kilowatt. Bitter experience has also taught us that this figure only holds good for soft wood up to three inches thick. For greater thickness, we reduce the figure by 25 per cent, and for laminating of hard wood members, such as heavy maple butcher blocks, bowling pin blanks, etc., we use a figure of 50 square inches per minute per kilowatt.

Direct glue line heating is used extensively in the production of soft wood core stock. In this application, curing times as low as 20 seconds are often attained. This process is also used to produce solid maple furniture panels, laminated truck trailer flooring and many heavy constructions, up to six inches thick.

In the past, we had observed that glue line curing was not simultaneously accomplished over the entire area but progressed from the hot electrode to the grounded electrode and that a glue line width of six inches was the maximum that could be cured with consistently good results.

As a result of some experimentation, we found that by designing a load circuit which was not grounded at any point, thus making both electrodes hot, we could successfully cure glue lines as wide as 12 inches. We now employ this circuit on curing equipment in which finger jointed boards are conveyed in a horizontal position between a pair of vertically mounted electrodes. The glue in the finger joints of these boards, up to 12 inches wide, is cured while they travel through a 17-foot long electrode section at lineal speeds up to 100 feet per minute. The load circuit is a coupled, tuned circuit and develops very high voltage.

One of the major problems in direct glue line heating is arcing through the glue line from electrode voltage that is too high. At the beginning of the cycle the wet glue is very conductive and will not tolerate more than 1000 volts per inch of glue line width. We feel that the voltage limitation is so important that our edge gluing presses are supplied with a high frequency voltmeter. Operators are instructed to watch electrode voltage carefully and not exceed the stated maximum.

Other causes of trouble are improperly prepared material, insufficient moisture content and too long a time lapse between stock preparation and gluing.

For good results in edge gluing we recommend a sawn joint from a modern straight line rip saw with a carbide tooth blade. Stock should also be surfaced on one side before sawing. The saw must be kept in good adjustment with a true running, sharp blade.

All high frequency edge gluing presses hold the work flat between electrodes while edge pressure is applied and the glue cured. Therefore, the lumber must be surfaced on one side before sawing so that the resulting saw cut is at right angles to the surface of the board. It goes without saying that the saw must also cut straight and smooth.

Urea resin adhesives will not cure properly when used with lumber that has a moisture content below five per cent. The adhesive needs moisture for the proper polymerization of the resin.

If lumber is prepared for gluing and left for several days before being processed, it will either shrink or swell, depending on atmospheric conditions. The exposed ends of the stacked lumber will be slightly narrower or slightly wider than the centers of the boards and poor bonds will result.

Our third method of curing adhesives with high frequency energy is known as "stray field heating." It gets its name from the fact that the glue area to be cured is not in a direct field between electrodes but in a stray field between strip or bar electrodes of alternate polarity, arranged in the same plane.

It is obvious from Figure 4 that not all the glue line will be cured. It is in fact cured in strips between adjacent electrodes.

There are, of course, both advantages and disadvantages in this method of adhesive curing. The advantages are that it is fast and uses comparatively low power. The disadvantages are that it is prone to arcing between electrodes and does not cure the entire glue line.

The latter is partly offset by the fact that the cold setting urea resin in the uncured strips will cure by itself in an hour or two after removal from the press. The electrode construction is costly both in material and labor; if damaged by severe flash-over, it is expensive to repair.

Our presses for this type of gluing are called Panel-on-Frame presses. The name exactly describes the work they do. The stray field press glues a panel of plywood or hardboard to a wood frame for use in certain types of furniture and cabinets. Curing rates are about the same as we get in direct glue line heating, *i.e.*, up to 100 square inches of glue line area per minute per kilowatt.

Though the gluing of wood and wood products, is the major part of our work, mention should be made of two relatively new fields in which high frequency curing of adhesives is beginning to play an important part.

First, in the food packaging industry high frequency equipment is being used to cure the adhesive on waxed cartons containing frozen food. The equipment uses two long and narrow stray field electrodes, of special design, vertically mounted facing each other.

The cartons are filled with food product, glue applied to the flaps and the flaps closed by a standard packaging machine. They are then continuously delivered to the high frequency equipment in which special, low loss belts convey the carton through the electrode section. The carton flaps are sealed in three to five seconds, using a polyvinyl acetate adhesive. Production rates in a frozen food plant in Massachusetts average 32,000 cartons per seven hour shift.

Stray field electrodes are specially designed to give just enough penetration to heat the adhesive, but not the food product, in the time in which the carton passes through the electrode section. While this adhesive is not heat setting in the sense that urea resins are, we cure it by heating rapidly and driving off the major portion of its moisture. It is more of a drying process than a true curing process.

The second new field is in the bookbinding industry. High frequency equipment is being used in several printing establishments to cure an adhesive film applied to the back of books before they go through trimming and covering operations. The same type stray field electrode as is used in carton sealing is employed.

For this application, a single electrode assembly horizontally mounted is used. The books are carried over the electrode system with their freshly glued backs down, about ⅛-inch from the electrode.

In both these fields, it is necessary to employ higher frequencies than in the wood gluing field. The thin paper will not stand the high voltages required for a heating cycle of no more than five seconds at a frequency of four to six mc. We go to 20 mc. and bring the voltage down to acceptable levels.

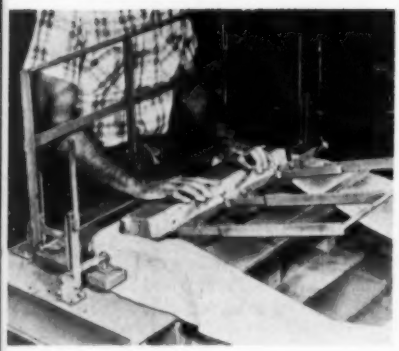
High frequency curing of adhesives has emerged from the so called "magic" stage and is now an accepted tool of industry. It is not a cure-all as some hoped it would be. There are many areas where it performs a remarkable service and there are some where it should not be used. It is our purpose to promote its use in those fields where it will be of real and lasting benefit to the user.

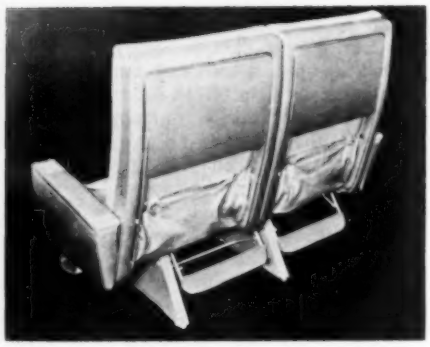
Walking A Taped Mile

More than a mile of pressure-sensitive, plastic tape was used during a recent open house to guide visitors through the new Owens-Illinois paper products plant at Shakopee, Minn.

The bright red tape, a Scotch brand product of Minnesota Mining and Mfg. Co., was selected over other possible methods because it could not only be easily applied and removed but eliminated the necessity of erecting obstructive guide ropes and posts.

Plant officials pointed out that the tape remained firmly in place despite the comings and goings of some 2700 guests.





In the top left photo, contact bond adhesive is applied to the aluminum back frame one to seven days prior to the actual leather bonding operation. The adhesive can be reactivated with solvent.

Adhesive is applied to the leather sections (top right) which are then water-soaked to facilitate the forming operation. The leather surfaces are wiped dry and given another adhesive coat.

Placing the freshly coated leather on the back frame is shown in the bottom left photo. The frame is mounted in a pressure fixture. Hold-down blocks and inner forms shape the leather at the frame's corners.

Jet airliner seat has top grain leather bonded to a contoured aluminum back frame. The same adhesive formulation is used to bond a foam plastic padding to the newly designed sculptured chair (bottom right).

Leather to Aluminum Bonding

Engineers at the Aerotherm Division of Aerotec Industries Inc., Bantam, Conn., were recently handed the assignment of developing a production line bonding technique that could be used in the fabrication of sculptured and contoured seats for the Boeing 720 Jetliner. The prime specification for the adhesive selected was that it permit instantaneous bonding of full top grain leather to an aluminum frame.

After extensive testing, production men selected a high strength, general purpose, contact adhesive, EC-1357, made by the Adhesives, Coatings and Sealers Division, Minnesota Mining and Mfg. Co., St. Paul, Minn. This formulation, they explained, not only gave them the strong bond required for the porous and non-porous surfaces involved, but had an open time that fitted in with production requirements.

On the production line, the portions of the aluminum back frame to which leather is to be bonded are pre-coated with adhesive. Because the adhesive can be solvent reactivated, it can be applied one to seven days prior to the actual bonding operation. This permits a backlog build-up of back frames to allow flexible production scheduling.

Soaking Leather

The leather sections are cut for wrap-around bonding to the aluminum seat frames, pre-coated with adhesive, and then thoroughly soaked with water to facilitate forming operations. Particular attention is given to those areas where deep forming is required during the bonding.

The adhesive is applied to the bonding surface before the water soaking operation to provide a waterproof surface that can be quickly, easily and thoroughly dried to facilitate instantaneous bonding.

After the soaking operation, the pre-coated adhesive surfaces are wiped free of excess moisture and a second brush coat of adhesive is applied. The adhesive coated leather is then placed on the contoured metal back frame which is mounted in a pressure fixture. In the fixture, a leather hold-down block shapes corners of wet leather around the outside corners of the aluminum back frame.

Combined clamps secure the block, apply pressure and bond the leather to the top and outside corners. The leather is then stretched by an inside corner form and bonded to the inside corners of the back frame. Stretching and pulling forces exerted during bonding operations do not weaken previously bonded areas because of the adhesive's rapid rate of strength build-up. The back frame is then removed from the pressure fixture and the leather is bonded to the side portion of the back frame.

Aluminum side panel sections of the seat assembly are leather covered in much the same manner as the back frame.

Bonding Utility Furniture Components

High strength and light weight are the features of these honeycomb panel tops used by All-Steel in the manufacture of modern office furniture. The photos below show some of the production steps in which the various components are adhesive-spread and joined.

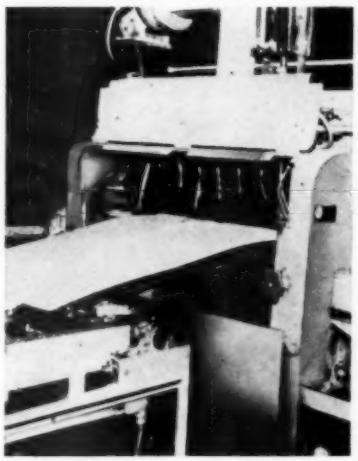
Production line bonding of paper honeycomb sandwiched between steel sheets is helping All-Steel Equipment, Inc., Aurora, Ill., turn out high quality desk and table tops for utility furniture.

Looking for an adhesive that would provide lifetime strength and yet be adaptable for assembly line application, All-Steel engineers settled on a thermoplastic rubber formulation developed by Armstrong Cork Co. A single versatile formulation is used to bond the steel to the kraft honeycomb, and a decorative linoleum or plastic surfacing to the steel. Here's how the production line is set up.

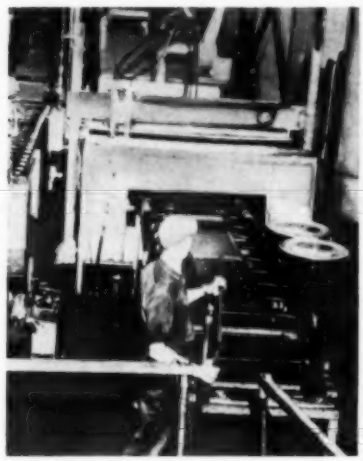
First, the adhesive is simultaneously spread on both sides of the core by passing it through a roll coating machine. On a separate line, adhesive is automatically sprayed on the insides of the steel panel skins.

Both the core and the skins then pass through ovens for controlled drying and reactivating. The panel elements continue along their separate production lines until they converge at a point of assembly. Here, the core is placed between two skins, and the sandwich is passed through a rotary press where the bond is completed.

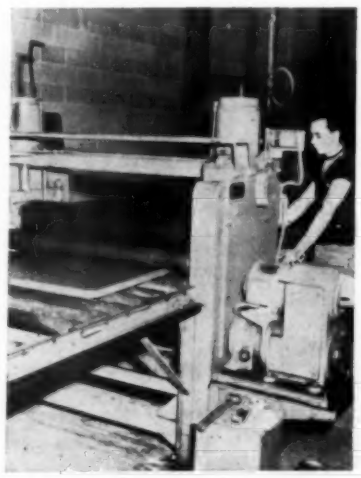
In the next step, linoleum or plastic surfacing material is bonded to the top of the panel. The underside of the surfacing and the upper surface of the steel panel are coated with adhesive, assembled and passed through pressure rolls. A special anodized aluminum edge trip with an attached resilient molding completes the desk or table top. The honeycomb structure eliminates the need for steel ribs or supports and as a result the desk or table top is flatter and more distortion free.



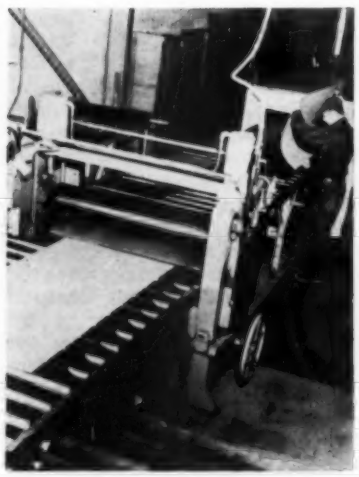
In an early production step, adhesive is applied to both sides of a honeycomb core as it passes through a roll coating unit.



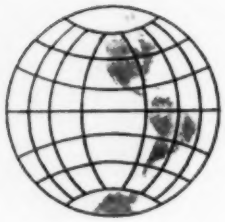
The insides of steel skins for the honeycomb panels are first sprayed with adhesive and then passed through a controlled oven.



The coated steel skins and honeycomb cores for the panel are assembled and the bond is completed by means of pressure rolls.



Pressure rolls are used to join the coated linoleum surfacing to the coated steel top of the assembled honeycomb core panel.



NEWS of the ADHESIVES WORLD

Adhesive Groups File Petitions With FDA

The Adhesive Manufacturers Association and the Syracuse University Research Corp. have filed petitions with the Food and Drug Administration regarding the safe use of adhesives for dry food packaging. The Association's petition listed as safe hundreds of substances used as components of adhesives for containers to be used in dry food packaging. The materials were listed under such headings as adhesives bases, pigments and fillers, plasticizers, solvents, antioxidants, adhesive ingredients, surface-active agents including defoamers, and miscellaneous.

The Syracuse University Research petition proposes the issuance of a regulation permitting the use, in paper and paperboard for food packaging, of animal glues consisting of collagen extracted from the hides and bones of freshly slaughtered animals to which may be added one or more of 56 listed substances, including chrome alum, diethylene glycol monooleate, ethylenediamine, formaldehyde, oleic acid, paraffin wax, rosin, and zinc stearate. Allowable percentages of each were also included in the list.

The filing of the two petitions carries no official status until the FDA examines, amends, and approves the petition. The FDA already has made a number of amendments and editorial changes in the petition of the Adhesive Manufacturers Association. The Association reports that its Ingredients and Labeling Committee is examining the FDA's amendments. Copies of the petitions can be obtained from the Adhesive Manufacturers Association, 441 Lexington Avenue, New York 17, N.Y.

C. E. Smith

Joins Armour Adhesives

C. E. Smith has been appointed as an adhesive sales-service representative for the Adhesives Division of Armour Alliance Industries, Alliance, Ohio. Mr. Smith will be responsible for sales and technical service of the firm's line of animal-base and synthetic adhesives. He will be assigned to the Wisconsin sales territory after completing a training program at Armour's adhesives administrative headquarters.

New Hercules Resin

Hercules Powder Co., Hercules, Calif. has developed a new water-white resin, called Parlon P, with physical properties similar to the firm's regular chlorinated rubber product, Parlon. The new clear films are said to be more stable under dry-heat tests at about 260°F. and are more stable under exposure to ultraviolet arcs. The chlorinated polypropylene is being used in adhesives, coating and printing inks.

Staley Develops Separation Process

A production process for separating pure amylose and amylopectin fractions from ordinary dent corn has been developed by A. E. Staley Manufacturing Co., Decatur, Ill. The company reports that it has completed and put in operation at Decatur a pilot plant which is fractionating starch—separating the two basic starch components in semi-commercial quantities and in reasonable degrees of purity.

The separated components can be used individually, the company states, or recombined in any ratio to tailor characteristics of the highly-branched amylopectin polymer and the linear-structured amylose polymer to any specific application. Staley states that among such possibilities for exploring and developing uses for amylose are transparent films, plastics, coating applications of all sorts, fibers, and filaments. The new series of starch products has been given the brand name of Napol, with the designations L for the pure amylose linear polymer and B for the amylopectin branched polymer.

Holds Sales Meeting

In its annual sales meeting, held last January, and conducted by Fred A. Palmer, sales and communications consultant, the Commercial Paste Co., Columbus, Ohio, emphasized the basic fundamentals of selling. Topics included "How to Close a Sale," "How to Tell What You Know" and "Sales Promotion." Mr. Palmer predicted an excellent year in 1961 for those who know how to "sell and serve" better than anyone else.

Adhesive Council Meeting

A seminar on Financial Control and Planning will be the feature at the meeting of the Rubber & Plastic Adhesive & Sealant Manufacturers Council, to be held on March 22 to 24, 1961, at the Hollywood-Roosevelt Hotel, Hollywood, Calif. F. M. Jeffe (Pierce & Stevens) will serve as general chairman of the seminar session.

The seminar subjects and speakers are: *Planning, Controlling and Forecasting in a Corporate Division,* R. L. Krentler (Cycleweld Chemical); *Costing an Adhesive,* Earl Sockel (Goodrich) and John Delmonte (Furane Plastics); *Inventory Control,* D. G. Williamson (Williamson Adhesives), Paul Cooper (Coast Pro-Seal) and J. S. Ross (Permalastic Products); *Order Processing,* T. R. Cutler (Miracle Adhesives) and Ralph C. Theiss (Battenfield Grease & Oil); *Budgeting—General Administrative and Research,* F. C. Johnston (Caram Mfg.) and Lloyd Cooper (Products Research).

Fiber Group Meets

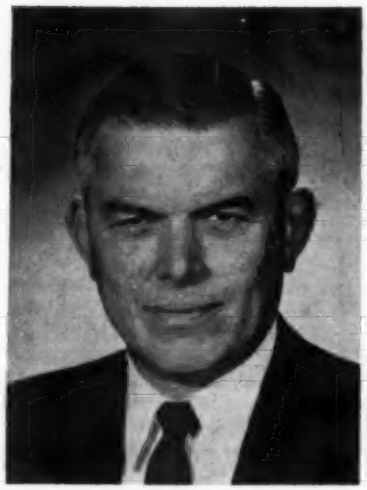
The National Fibre Can & Tube Association held a meeting on January 27, 1961, at the Hotel Astor in New York City, to discuss current and future developments within the industry. Dr. Robert B. Mesrobian, general manager of the General Packaging Research and Development Division of Continental Can Co., Chicago, Ill., was the featured speaker at the one-day meeting. Dr. Mesrobian discussed "New Plastics for the Packaging Industry," and also presented a report on polymer developments in the United States, Europe, and the U.S.S.R.

Other speakers at the meeting included William D. Turner, partner in the law firm of Buell, Clifton & Turner, who discussed management aspects of labor relations and T. C. Ketcham, sales engineer with Paper Converting Machine Co., Green Bay, Wisc., whose topic was the latest equipment for winding, cutting, and printing light-weight paper tubes.

Named by Interchemical

Howard Ellerhorst, Jr. has been appointed Atlantic district sales manager for the Finishes Division of Interchemical Corp., Cambridge, Mass. Mr. Ellerhorst previously had been adhesives sales director for the Angier Adhesives Department of the Finishes Division of Interchemical.

R. W. Mueller



R. W. Adam

Named to New 3M Assignments

New management assignments in pressure-sensitive tape and related products areas have been made by the Minnesota Mining & Manufacturing Co., St. Paul, Minn. Robert W. Mueller, a vice-president of 3M and former head of the Industrial Tape Division, has been given overall responsibility for operations of the division and the Retail Tape and Gift Wrap, Mid-States Gummed Paper, and Derby Sealers Divisions of 3M. Robert W. Adam, formerly general manufacturing manager for all 3M pressure-sensitive tape, has been appointed general manager of the Industrial Tape Division. E. L. Decker, formerly general sales manager of the Industrial Tape Division, becomes general sales and marketing manager for the division. Mr. Decker also will direct operation of Mid-States Gummed Paper Division at Bedford Park, Ill., and Derby Sealers Division at Derby, Conn. N. H. Gunderson, manager of Mid-States, and A. P. Krueger, resident manager of Derby Sealers, will continue in their posts, reporting to Mr. Decker.

Shell Epoxy Paste

Developed by the Adhesive Department of Shell Chemical Co., Pittsburg, Calif., Epon Adhesive 901 is said to be a solvent-free epoxy paste which can be cured with four versatile liquid curing agents for a wide range of industrial bonding applications. The epoxy resin is a grey paste and when it is mixed with any of the four curing agents, the resultant adhesives are thixotropic even during cure at high temperatures, the company states. According to Shell, the cured adhesives supply tensile strengths up to 3800 psi, and they are resistant to salt spray, water, and most organic liquids. In addition, the four curing agents offer cure conditions from room temperature to 300°F., and are said to meet most bonding requirements.

Celanese Chemical Plant

Celanese Chemicals Division of Celanese Corp. of America plans to construct a new chemical plant in Bay City, Texas, which will produce acetaldehyde and 2-ethyl hexanol, used in a variety of adhesives, plastics and other products. Unofficial estimates indicate that the plant will cost over $12 million. The facility will produce about 100 million pounds of chemicals and will raise Celanese Chemical's productive capacity to more than one billion pounds a year. Celanese will use a special process which blasts air through a by-product of petroleum called ethylene. The process license was obtained from Aldehyd G.m. b.H., a company owned jointly by Farbwerke Hoechst and Wacker Chemie of West Germany.

A-D-M Reorganization

W. C. Mueller, formerly sales manager of the Resins Division for Archer-Daniels-Midland Co., Minneapolis, Minn., has been appointed manager of the newly-formed Resins Department. The appointment follows a reorganization of the company's chemical group, which establishes group marketing and production managers, five department managers and a field sales administrator. The new grouping replaces the former three divisions—Industrial Chemicals, Resins, and Plastics—each with its own production and sales personnel. A-D-M says that the new organization is designed to concentrate research, production, service and sales efforts on the specific needs of its chemical group customers.

The other appointments are: Dr. George K. Nelson, formerly manager, Industrial Chemicals Division, as marketing manager of the entire chemical group; J. C. Burkholder, formerly Resin Division manager, as group production manager; H. B. Finch, formerly manager, Industrial Chemicals Division, as Plastics Department manager; J. H. Kane, formerly sales manager, Industrial Chemicals Division, as Industrial Chemicals Department manager; W. A. Jarvey as Plasticizers Department manager and R. G. Freese as Nitrogen Chemicals Department manager, both formerly product managers within the Industrial Chemicals Division; and Hall Dillon, formerly sales coordinator, Resins Division, as field sales administrator for the chemical group.

Organosol Coatings

A new line of organosol coatings, called Sterilkote 360, has been developed by Bradley & Vrooman Co., Chicago, Ill. The company says that the new coatings give excellent metal adhesion with only one application and without the use of a primer. The one-coat organosols are vinyl resin based and may be applied by means of manual, automatic or electrostatic spray equipment and by regular and reverse roll coaters. Baking cycles may be varied to suit different production ovens. Bradley & Vrooman states that because of their abrasion-resistance, flexibility and resistance to water, salt spray, peeling and marring, the organosols are suitable for a wide range of applications, including metal furniture and shelving, office equipment and interiors of cars, buses and trains.

Borden Plant Expansion

Borden Chemical Co., New York, N.Y., has announced an overseas expansion program which calls for construction of a new plant outside Paris, France, and construction of additional facilities in England, thus doubling capacity of its subsidiary, Leicester, Lovell & Co., Ltd., Southampton. The Paris plant will manufacture and sell synthetic resins to countries in the European Common Market. The Southampton expansion will increase productive capacity of the firm by 13 million pounds annually. Leicester, Lovell now produces 14 million pounds of thermosetting resins, including urea-formaldehyde, phenol-formaldehyde, epoxy, and resorcinol-formaldehyde. Borden Chemical has also announced construction of its 11th overseas subsidiary, Borden Chemical Co. (France) S.A., which will produce a variety of thermosetting resins.

Hercules Formaldehyde

Hercules Powder Co., Hercules, Calif., has begun operations at its new manufacturing facilities for the production of formaldehyde and urea-formaldehyde concentrates, among other products. The newly-completed expansion program provides facilities for production of 50 million pounds of formaldehyde and 11,000 tons of urea-formaldehyde compositions annually.

Dow Phenol Plant

Dow Chemical Co., Midland, Mich., plans to construct a phenol plant at Kalama, Wash. According to the company the new facility will have an annual capacity of 36 million pounds of phenol, and is expected to go on stream in mid-1962.

"Certainly our adhesive is as good as Foon adhesive. As a matter of fact, Foon adhesive is one of our secret ingredients!"

Named by U B S

Dr. Lloyd H. Perry and John C. Smith have been appointed vice-presidents of U B S Chemical Co., Cambridge, Mass. Dr. Perry, previously technical director for the firm, becomes vice-president and technical director, and Mr. Smith, formerly director of marketing and sales, is vice-president and director of marketing and sales.

Dr. Perry is a graduate of Wesleyan University and, prior to joining U B S as technical director in 1948, was an instructor at the University of New Hampshire and a Teaching Fellow and research associate at the Massachusetts Institute of Technology. He received his master's degree from the University of New Hampshire in 1940 and his Ph.D. in organic chemistry from M.I.T. in 1946. Dr. Perry is chairman of the Northeastern Section of the American Chemical Society, and a member of the American Society for Testing Materials.

Mr. Smith graduated from the University of Massachusetts in 1950 with a B.S. degree in chemistry. Prior to joining U B S in 1957 as industrial sales manager, he was associated with Pitman-Moore, Inc. In 1960, he was named director of marketing and sales at U B S.

M.I.T. Adhesive Course

An intensive course on adhesive joints will be given at the Massachusetts Institute of Technology, Cambridge, Mass., on June 26 to 30, 1961. Ten lectures and discussion periods, about three hours each, are scheduled, and the lecturers will include university and industry scientists. Among the topics to be discussed are: solid surfaces, wetting, application of adhesives, tack, setting, testing, stress concentrations, adhesion in laminates, and strength of adhesives and joints. Persons interested in attending the five-day adhesive course can obtain additional information and application blanks from the Office of Summer Session, Massachusetts Institute of Technology, Cambridge 39, Mass.

Dutch Chemical Plant

Dutch State Mines, the Netherlands' largest government-owned chemical producer, has slated construction of a formaldehyde plant with a capacity of 25,000 metric tons a year. The unit will be located at Beek in Limberg and will produce a 40 per cent formaldehyde solution.

Amsco Sales Staff

American Mineral Spirits Co., New York, N.Y., has announced seven changes in its sales staff: Robert L. Moore, Jr. has been appointed manager of the New England Sales Division, with headquarters at the Somerville, Mass., plant, succeeding W. B. Richardson who has retired; Robert E. Benson succeeds Mr. Moore as assistant division manager; Charles J. Hoar has been named a sales trainee on the Somerville staff; Arthur A. Vetter has been appointed assistant manager of the Murray Hill Sales Division, with headquarters in Murray Hill, N.J.; D. A. Caprario has been transferred to the Murray Hill Sales Division from Amsco's Cumberland district, Nashville, Tenn.; Richard A. Steele has also been moved to Murray Hill to represent the company in the sale of solvents, chemicals, waxes and specialty products; and W. T. Padgett has been moved from the Atlanta area to the Cumberland district at Nashville.

Fuller Names Slavin

George E. Slavin, previously industrial sales representative in the Minneapolis-St. Paul area for the H. B. Fuller Co., St. Paul, Minn., has been appointed manager of a new Distributor Sales Department. He will promote the sale of Fuller's consumer products and be responsible for establishing sales contacts with industrial distributors for certain other products. Mr. Slavin will concentrate on sales of products for the home owner, such as the firm's Resiweld, Resiwood and all-purpose adhesives. He will also expand distribution of Fuller's liquid bowling ball plug, rubber cement, and a few epoxy products for industrial maintenance.

Harchem Curing Agent

A linear polymeric anhydride that is said to function as a flexibilizer as well as a curing agent for epoxy resins has been developed by the Harchem Division of Wallace & Tiernan, Inc., Belleville, N.J. Designated Harcure A, the material is reported to have excellent thermal shock properties as well as good high temperature electrical properties to cured epoxy recipes. According to the company, Harcure A can be formulated with liquid or solid epoxy resins into a single component system with prolonged shelf life at room temperature.

Packaging Foundation

The Michigan State University School of Packaging Foundation, Inc., is a nonprofit corporation established in 1957 to provide financial assistance to the School of Packaging at Michigan State University, East Lansing, Mich. The Foundation is empowered to accept tax exempt contributions to be used to expand instructional facilities and to support basic and applied post graduate and special training programs. According to the Foundation it needs funds to accomplish three immediate goals: (1) The provision of a suitable physical plant to house the packaging program, with a tentative goal of $2 million for the purpose; (2) Support of a research program in the field; (3) Support of a graduate program for advanced students. Michigan State University will continue to provide the teaching staff and maintain the school after the funds have been subscribed to build the new School of Packaging. Persons and companies interested in contributing to the Foundation's program should contact H.G. Walter, Executive Director, 2918 Kenneth Avenue, North, Chicago 41, Illinois.

New Bakelite Resin

Union Carbide Plastics Co., New York, N.Y., has developed a new stir-in type dispersion resin, Bakelite vinyl resin QXKV-2, which is available for high quality coating and molding applications. The vinyl resin yields high structures at low rates of shear and at rapid gelation rates, the company states. Designed for plastisol and high-solids, low-solvent organosol dip coatings, the resin is said to give exceptional performance in rotational and slush molding applications and in machine-applied coatings. Union Carbide states that good viscosity is maintained in dip tanks and during slush molding recycling. In addition, plastisols based on vinyl resin QXKV-2 can be readily vacuum deaerated, will release air rapidly, and are less affected by humidity during the process than plastisols based on other resins of this type, the company states.

Staley Overseas Venture

Under a new working relationship between the A. E. Staley Manufacturing Co., Decatur, Ill., and two European corn refiners, the firm's wholly-owned Swiss subsidiary, Staley A.G., has purchased a financial interest in Glucoseries Reunies, S.A., Alost, Belgium, and a minority interest in Tunnel Glucose Refineries Ltd., London, England. Neither firm becomes a Staley subsidiary under the new arrangement. The move was made to increase the exchange of technical information between the Decatur corn, soybean and chemical processing concern and the two overseas firms, and to provide facilities to produce and market Staley's new products in the European Common Market countries and the United Kingdom, the company states.

Packaging Course

The Division of Adult Education of Purdue University, Lafayette, Indiana, is offering its ninth annual two-week course in Industrial Packaging, to be held on-campus from March 20 to 31, 1961. The course is aimed at giving executives, purchasing agents, engineers, military packaging men and sales representatives a basic knowledge of containers and packaging materials. It is being given by packaging consultant Charles J. Zusi, who has arranged for lectures and demonstrations by leading authorities in the field as well as engineering professors on the Purdue University staff. For further information, contact Mark E. Ocker, Division of Adult Education, Memorial Center, Purdue University, Lafayette, Ind.

Dutch Brand Moving

The Dutch Brand Division of Johns-Manville Corp. is transferring its headquarters from Chicago to New York. According to the company, the move is expected to facilitate the introduction of a new line of products produced by the division at plants in Tilton, N.H., and South Chicago, Ill. The move is expected to be completed by the end of April, 1961.

The company reports that several new products are ready for nationwide distribution. They are: eight new grades of cork-and-rubber gasketing materials in continuous rolls; two heavy duty strapping tapes, one reinforced with glass fiber, the other with rayon; and a polyethylene pipe wrapping tape.

New Borden Divisions

Three new divisions have been formed at the Borden Chemical Co., New York, N.Y., each to be headed by a newly-appointed vice-president. The new vice-presidents and their divisions are: Raymond J. Lodge, formerly general manager of the Resins & Chemicals Department, as vice-president of the Adhesives & Chemicals Division (representing a consolidation of the Resins & Chemicals Department and the Coatings & Adhesives Department); Ray T. Hanson, formerly general manager of the Western Operations Department, as vice-president of the Western Operations Division; and Harry C. Wechsler, formerly vice-president for commercial development, as vice-president of the Thermoplastics Division (consolidating the Polyvinyl Chloride, Resinite and Polyco-Monomer Departments).

Flexible Curing Agents

Three new flexible curing agents for epoxy resins, described as amine-terminated aliphatics with controlled and limited functionality, have been introduced by Dow Chemical Co., Midland, Mich. Called Experimental Hardeners X-3483.1, X-3483.2, and X-3483.3, they are said to be colorless liquids with very low viscosity. The company suggests their use to control flexibility, viscosity, and exotherm in both conventional epoxy resins and its own new flexible epoxy resins.

Wallace Glue Spreaders

A new line of glue spreaders and roller coaters designed for coating plywood, hardboard, metal, and paperboard with adhesives, lacquers, enamels, and oils is being manufactured by L. R. Wallace & Co., Pasadena, Calif. Designated Series 58, 60, and 61 all machines are available in single top coater, two models of double coaters, and a single bottom coater, with lengths from 8 to 72 inches. Series 58 has 6-inch rolls, Series 60, 4-inch rolls, and Series 61, 5-inch rolls.

Monsanto Acid Plant

Monsanto Chemical Co. has begun construction of a phenolsulfonic acid unit at its Avon, Calif., plant. The new unit will increase Monsanto's over-all capacity by about 50 per cent. Previously, the acid had been produced at the firm's plant at Monsanto, Ill.

National Society for Crippled Children and Adults
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Chicago 12, Ill.

Coating Patent Issued

U. S. Patent 2,955,953, issued October 11, 1960, to Boynton Graham and assigned to E. I. du Pont de Nemours & Co., describes a process for coating an organic polymer substrate with a dissimilar organic material.

The polymer substrate is subjected in the absence of oxygen to ionizing charged particle radiation having an energy of from 15 to 50,000 electron volts for a minimum exposure of 0.01 watt-seconds per square centimeter but for a maximum exposure insufficient to degrade the organic polymer. Thereafter, while the effect of irradiation is still active, a coating of the dissimilar organic material is applied to the organic polymer.

Tong Appointed

Robert M. Tong, formerly with General Latex and Chemical Corp., has joined Manufacturers Chemical Co., Inc., Camden, N.J., as general sales manager. The company produces a line of latex backings, softeners, flame retardants, water repellants, binders for non-woven fabrics, hosiery finishes and other textile processing chemicals. Mr. Tong has had experience in textile chemical and resin sales and new product development.

Particle Board Meeting

Plans for an accelerated promotion program and development of standards were formulated by the National Particleboard Association at its Annual Meeting on January 10 to 11 in Washington, D.C. The Association also outlined plans for gathering statistics on the industry as a whole, and approved a program for liaison with related trade groups. At the meeting, Richmond Gray (Gray Products) was elected president of the Association. Other officers elected were William H. Cooke (Pacqua, Inc.), vice-president and C. G. Reiter (Formica), secretary. Richard L. Rinde was re-elected treasurer.

Vinyl Highway Marker

Morgan Adhesives Co., Stow, Ohio, is marketing Goodyear's reflective yellow vinyl film for use in highway marking for traffic control. The film has an adhesive backing which permits it to stick to the pavement, the firm says. It is claimed that the film strips give 50 per cent longer life than painted markers. The material can be made into strips for all types of traffic control signs, such as crosswalk and lane markers, directional arrows, numerals and letters identifying speed control zones.

Handi-Stik Labels

Paramount Paper Products, Omaha, Neb., has introduced an assortment of 12 types of self-sticking, adhesive-backed labels for consumer use. Called Handi-Stik labels, they are packaged in a dispenser-type container which holds from 30 to 90 labels of one kind. Some of the labels offered are: contents labels, gift labels, freezer labels for meats, personal property labels, airmail and special delivery labels, fragile, and blank labels.

Hooker Earnings Up

Hooker Chemical Corp., New York, N.Y., reports that consolidated net sales totalled $149,820,580 for the fiscal year ended November 30, 1960, slightly higher than the record of $149,817,496 set the previous fiscal year. Consolidated net income after taxes, however, was $12,688,877 in 1960, compared with $13,401,636 the previous year. Earnings dropped from $1.80 to $1.70 per common share after preferred dividend requirements were met.

High Temperature Oven

An oven equipped with five separate drawers which allow insertion, removal, and inspection of test items without disturbing the internal environment or other specimens has been developed by Electric Hotpack Co., Inc., Philadelphia, Penna. This new mechanical convected oven can be used for pre-heating, drying, baking, curing, and other heat treating processes, the company states. The oven has a temperature range of 35° to 260°C., ±0.5°C. The drawers are constructed of aluminum, perforated to permit maximum air flow and rendered airtight with asbestos gasketing. The controls include a wattage selector switch, automatic thermostat, and an over-temperature controller that cuts the heater circuits in the event chamber temperatures exceed the control setting.

Flame-Proof Adhesive

Java Latex and Chemical Corp., New York, N.Y. has developed a new flame-resistant flocking adhesive, called Java-Flok, which can be used to decorate toys, novelties, displays, artificial flowers, plaster ornaments, natural wood branches and other materials. Java-Flok is a white, water-based adhesive which is applied by dipping, brushing or spraying the object to be decorated. The coated object can then be treated with flock or other decoration. The new adhesive is flame-resistant and fast-drying, and retains its adherence properties with age, according to the firm.

Self-Adhesive Plaque

Avery Label Co., Monrovia, Calif., has developed a new battery identification plaque, made from a pressure-sensitive material designed to withstand acid environments. The parts are manufactured from an acid-resistant polystyrene and are backed with an adhesive said to be unusually strong and pressure-sensitive. According to Avery, the labels do not need to be moistened to adhere to the battery surface and they eliminate the need for special metal plates or molds for identification.

A-D-M Laminating Resins

A new line of isophthalic polyester laminating resins is being manufactured by Archer-Daniels-Midland Co., Minneapolis, Minn. The new resins, Q-6009 and Q-6010, are said to go farther on the production line because of their rapid wet-out time. They also feature low exotherm, high stability, fast setup time, good trim time and resistance to water, according to A-D-M.

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If we are to keep our place among the leading nations of the world, we must do something about this grim situation before it is too late. The tuition usually paid by a college student covers less than half the actual cost of his education. The balance must somehow be made up by the institution. To meet this deficit even the most heavily endowed colleges and universities have to depend upon the generosity of alumni and public spirited citizens. In other words, they depend upon *you*.

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Clark Succumbs

George H. Clark, retired vice-president of manufacturing of the Formica Corp., Cincinnati, Ohio, died in Cincinnati on December 30. Mr. Clark taught engineering after his graduation from M.I.T. in 1913 and joined Formica in 1926. His duties as vice-president placed him in charge of building and supervision of plant facilities, including Formica's Evendale, Ohio, laminating plant. Mr. Clark also served as director, then president and, finally, chairman of the Society of the Plastics Industries, and was associated with the Laminated Plastics Section of NEMA. He retired from Formica in 1956, but remained with the company as a consultant. Surviving are his wife, a son and two grandchildren.

FINAT Formed

European manufacturers and converters of pressure sensitives and thermoplastic adhesives on paper, have formed an organization, called International Federation of Manufacturers and Converters of Pressure Sensitives and Thermo-Plastic Adhesives on Paper and Other Base Materials (FINAT), whose aim is the development of the adhesive paper industry in the European market and the projected Free Exchange Zone. The federation conducts research aimed at improvement of quality, research on standardization and collects statistical data relating to the industry. The secretary-general of FINAT is Rene du Boucheron, 36 Rue de Chateaudun, Paris 9, France.

Monsanto Capital Outlay

Capital expenditures of Monsanto Chemical Co. for 1961 will reach $75 million, as against $58 million last year, the company announced. Of this amount, a little more than $33 million is slated for research. Combined capital expenditures of the company and its overseas subsidiaries will come to $108 million, compared to $76 million in 1959, the company disclosed.

Avery Names DeWitt

Neil DeWitt has been appointed consumer products manager of Avery Label Co., Monrovia, Calif. The company states that the appointment represents the first step in building up its consumer products marketing program. Mr. DeWitt will be responsible for expanding the firm's present consumer product lines and distribution channels.

Mettler Balances

The Type H analytical balances feature built-in concentric weights for greater stability in addition to a plastic case for maximum heat insulation, states the manufacturer, Mettler Instrument Corp., Hightstown, N.J. Two models are available, Type H-15 with a capacity of 160 grams and an accuracy of ±.05 mg, and Type H-16 which has a capacity of 80 grams and an accuracy of ±.02 mg. Both models feature air damping and an optical projection system for read-out of quantities below 100 mg.

BRI Adhesive Program

The Adhesives & Sealants Planning Committee of the Building Research Institute has arranged a full program on adhesives on May 16 to 18 during the BRI Spring Conferences at the Shoreham Hotel in Washington, D.C. The adhesive program includes a workshop on sealants for thin-shelled concrete roofs, a conference on sealing building joints with tapes, and a seminar on the selection and application of adhesives in the field.

R-M Adds To Paper Line

Raybestos-Manhattan, Inc., Manheim, Penna., has developed a new type of asphalt saturated base paper which it is adding to its Novabestos line of products, such as treated papers, composite paper, and glass cloth material. Said to be highly purified, the paper, designated Style No. 7505, combines unusual strength with fine texture and is available in rolls, sheet, or tape form.

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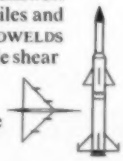

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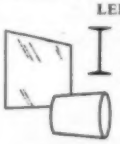

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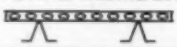

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March 5-9. American Society of Mechanical Engineers, Aviation Conference, Statler Hilton Hotel, Washington, D.C.

March 7-10. American Society for Testing Materials, Committee D-20 on Plastics, Sheraton Hotel, Louisville, Ky.

March 9-10. Hardwood Plywood Institute, Spring Membership Meeting, Shoreham Hotel, Washington, D.C.

March 13-17. National Association of Corrosion Engineers, Annual Conference, Statler Hotel, Buffalo, N.Y.

March 15-16. Commercial Chemical Development Association, Annual Meeting, Hotel Roosevelt, New York, N.Y.

March 20-31. Ninth Annual Industrial Packaging Course, Purdue University, Lafayette, Ind.

March 20-22. Folding Paper Box Association of America, Annual Meeting, Drake Hotel, Chicago, Ill.

March 20-24. American Society for Metals, 12th Western Metal Congress and Exposition, Pan Pacific Auditorium, Los Angeles, Calif.

March 21-30. American Chemical Society, 139th National Meeting, St. Louis, Mo.

March 22-24. Rubber & Plastic Adhesive & Sealant Manufacturers Council, Spring Meeting, Hollywood Roosevelt Hotel, Hollywood, Calif.

March 23-24. Committee D-14 on Adhesives, American Society for Testing Materials, Wash., D.C.

March 28-29. Commercial Chemical Development Association, Annual Meeting, Hotel Roosevelt, New York, N.Y.

March 31. Packaging Institute, Joint Symposium with National Paper Box Manufacturers Association, Sheraton Hotel, Philadelphia, Penna.

April 4-6. Research and Development Associates, Food and Container Institute, 15th Annual Meeting, Hotel John Marshall, Richmond, Va.

April 9-13. American Association of Cereal Chemists, 46th Annual Meeting, Baker Hotel, Dallas, Texas.

April 9-15. National Association of Architectural Metal Manufacturers, 23rd Annual Convention, Plaza Hotel, New York, N.Y.

April 10-11. American Society of Mechanical Engineers, Maintenance & Plant Engineering Conference, Hotel Bancroft, Worcester, Mass.

April 9-13. American Management Association, 30th National Packaging Exposition, Lakefront Exposition Hall, Chicago, Ill.

April 18-20. Stanford Research Institute, Symposium on Chemical Reactions in the Lower and Upper Atmospheres, Mark Hopkins Hotel, San Francisco, Calif.

April 20-21. Society of the Plastics Industry, 18th Annual Western Section Conference, Hotel Del Coronada, Coronado, Calif.

April 23-26. American Society of Mechanical Engineers, Metal Engineering Conference, Penn Sheraton Hotel, Pittsburgh, Penna.

April 23-27. American Ceramic Society, 63rd Annual Meeting, Royal York Hotel, Toronto, Ontario, Canada.

May 2-9. Sixth International Packaging Show, R. A. Exhibition Building, Amsterdam, The Netherlands.

Portrait Of

ROBERT S. SHANE

Dr. Robert S. Shane is the consulting engineer at the Light Military Electronics Department of General Electric Company, Utica, N.Y. Part of his duties include consultation in materials and material applications, and he is often called in to advise on adhesives and adhesive techniques for new experimental or production line bonding applications.

Prior to joining General Electric in 1958, Dr. Shane was associated with the Bell Aircraft Corporation where he was technical director and nucleonics specialist of the Rockets Division. Earlier, he was manager of the Chemistry, Ceramics, Powder Metallurgy Section of the Westinghouse Atomic Power Department.

A native of Chicago, Dr. Shane attended the University of Chicago, where he received his B.S. and Ph.D. degrees in chemistry. He is the author of numerous papers and articles including the following: "Preparation of Metal Surfaces for Structural Adhesives," "Core Materials and Fabrication," and "Desealing, Cleaning, Resealing of Integral Wing Fuel Tanks."

Dr. Shane is an active member of ASTM's Committee D-14 on Adhesives, the American Chemical Society, the American Institute of Chemical Engineers, and the American Nuclear Society. He was Guest Instructor in the Atoms for Peace program, held at Pennsylvania State University.

Borden Research Leader

Dr. Alberto Malatesta has been named research group leader of the Central Research Laboratories of the Borden Chemical Co. The company has also appointed Martin H. Adelman, Jordan E. Dannin, Anton Jurecic, George J. Kollmann and Paul J. McGonigal as research chemists. Dr. Malatesta received his Ph.D. in organic chemistry from the State University of Padova, Italy. He previously served as a research associate at the Polytechnic Institute of Brooklyn and as research chemist at the Dunlop Research Center in Canada. Dr. Malatesta will concentrate his efforts in the field of polymer research.

Wadsworth Retires

Borden Chemical Co., New York, N.Y., has announced the retirement of Barton B. Wadsworth, a vice-president of the firm. He joined Borden as an industrial sales representative in 1931, two years after the founding of the company. He became sales manager of the Industrial Adhesives Department in 1939 and was promoted to assistant general sales manager for Borden Chemical in 1944. He has been vice-president of the firm since 1951.

New Chem Seal Dealers

Chem Seal Corp., Los Angeles, Calif., has announced plans to add 250 distributors and dealers to its national sales organization. They will handle the company's line of polysulfide and epoxy products for industrial and construction uses in all 50 states. The company states that it has also developed special training and promotional programs to aid in the merchandising of its materials.

Adhesive Unit in Brazil

Ebeq Produtos Quimicos Industrials, Ltd., a new Brazilian firm, has opened an experimental plant in Sao Paulo, Brazil, to manufacture adhesives for industrial purposes. According to reports, the company already has made deliveries to a number of firms, including plastics manufacturers.

Dow Licenses Stauffer

Stauffer Chemical Co. and Dow Chemical Co. have reached a settlement on an infringement suit involving Dow's patents on production of chlorinated solvents. According to the terms of the settlement, Stauffer will be licensed under the Dow patents, in consideration for which Dow will receive about $1.5 million.

Small Shot Dispenser

The Micro-Shot dispenser, developed by Automatic Process Controls, Inc., Union, N.J., is designed for metering, mixing, and dispensing small quantities of two-component resin systems over a wide range of materials and operating conditions. Said to be able to produce a shot volume from a fraction of a cubic centimeter to 20 cubic centimeters, the Micro-Shot is particularly applicable for adhesive and casting jobs. The manufacturer states that the dispenser is suited for end capping micro modules, transistors, resistors, and capacitors. The machine is an electro-pneumatic device with a unique metering mechanism. Resin and activator components are placed in separate pressure vessels to which air pressure is applied. This forces the material through the feed lines and inlet valves on the metering cylinder cavities filling them completely. Exact proportions of the materials are consistently achieved with each shot because the two metering cylinder rods are connected to a common ration arm which is pivot mounted. Pumps and controls for degassing resin and vacuum casting are available as optional features.

names in the news

R. E. Kimball has been appointed eastern sales representative for the Glue Division of Darling & Co., Chicago, Ill.

Alden H. Emery, executive secretary of the American Chemical Society, has been awarded the 1961 Gold Medal of the American Institute of Chemists for his contributions to the advancement of the chemical profession.

Ronald L. DeHoff has been made a market development representative for the Epoxy Department, Chemicals & Plastics Division, Food Machinery and Chemical Corp., New York, N.Y.

Theodore F. Bradley, head of the Plastics and Resins Department at the research center of Shell Development Co., Emeryville, Calif., has retired after 15 years with the company.

Richard E. McFarland has been named advertising manager of the Avery Label Co., Monrovia, Calif.

Robert N. Stickney, formerly plant manager at the Demopolis, Ala., plant of Borden Chemical Co., has been transferred to its Illiopolis, Ill., plant as works manager.

Herman A. Peed becomes production superintendent at the Leominster, Mass., polyvinyl chloride plant of Borden Chemical Co.

John E. Dereich has been appointed to the staff of the Technical Division of Neville Chemical Co., Pittsburgh, Pa.

James W. Field, formerly with the Technical Association of the Pulp & Paper Industry, has joined the Packaging Institute as technical field director.

L. J. Markwardt, recently retired assistant director of U. S. Forest Products Laboratory, Madison, Wisc., has been named a vice-president of the International Wood Research Society.

James M. Hait, formerly executive vice-president and director of engineering of the Ordnance Division of Food Machinery & Chemical Corp., San Jose, Calif., has been elected president of the company.

John F. Kilcullen has been made vice-president of manufacturing for the Nuodex Products Division of Heyden Newport Chemical Corp., New York, N.Y.

John A. Rodda will direct activities of the Washington, D.C., office of Food Machinery & Chemical Corp., as assistant to the president.

Theodore M. Jenney, previously with the Becco Chemical Division of Food Machinery & Chemical Corp., has joined the staff of Arthur D. Little, Inc., Cambridge, Mass.

Richard W. Reiter, formerly employed in the Resin Division of National Starch and Chemical Corp., New York, N.Y., has been promoted to laboratory manager of the resin development group.

Wayne E. Whitney, previously chief chemist at the Jackson, Mich., plant of American Marietta Co., has been promoted to assistant director of research for the firm's Presstite Division in St. Louis, Mo.

William H. Otto has been appointed research specialist for the Research & Development Division of Narmco Industries, Inc., San Diego, Calif.

Lee L. Blyler, formerly vice-president of Howe & French, Inc., Weymouth, Mass., has been elected president of the company.

James Dennis has been appointed group leader of analytical research at the Marbon Chemical Division of Borg-Warner Corp., Washington, West Va.

Oliver N. Salmon has joined Minnesota Mining & Mfg. Co. as senior chemist at its central research laboratories in St. Paul, Minn.

James F. McGann has joined the Development Department of Archer-Daniels-Midland, Minneapolis, Minn., as market development chemist.

John Boeheim has joined the sales staff of the Chemical Division of General Mills, Minneapolis, Minn., and will be headquartered in Philadelphia. **B. E. Woodall,** another addition to the Chemical Division's sales staff, will work out of Houston, Texas.

Richard I. McCullough has been made research supervisor in analytical chemistry at the Grand Island, N.Y., research center of the Hooker Chemical Corp., Niagara Falls, N.Y.

G. H. Chidester, of the U. S. Forest Products Laboratory, was awarded the 1961 TAPPI Medal by the executive committee of the Technical Association of the Pulp & Paper Industry.

Dr. James W. Goff has been promoted to professor in the School of Packaging of Michigan State University, possibly the first person to attain a full professorship in packaging at any school.

Jay K. Gellenwater, formerly director of purchases for Eastman Kodak Co., Kingsport, Tenn., has been appointed director of purchases for Tennessee Eastman Co., a division of the firm.

Warren S. McGregor has joined the research center of General Foods, Tarrytown, N.Y., as project leader in packaging development.

J. C. Mulholland becomes vice-president of sales for the Paperboard Division of Packaging Corp. of America, Evanston, Ill.

James D. Moran, an assistant vice-president of The Flintkote Co., New York, N.Y., has been appointed assistant to the president of the firm.

Burl W. Keys, previously manager of the Electrical Products Division of Permacel, New Brunswick, N.J., has been appointed manager of the Electrical Insulation Products Department.

Dr. Alex Katona, formerly a product development representative, has been appointed supervisor of the pilot plant of the Research and Development Department of Hooker Chemical Corp., Niagara Falls, N.Y.

New Curtain Wall From Armour

A method for using marble for curtain walls has been developed by the Armour Research Foundation, Chicago, Ill. According to the Foundation, the marble is used in very thin sheets and prefabricated assemblies so that it can meet demands of low initial cost.

In the panels developed by Armour Research, a thin sheet of marble—⅝ inch thick—is bonded to an insulative core material, such as foamed glass, paper honeycomb, or wood fiberboard, then bonded in turn to the interior surface, which may be sheet metal, plywood, or another material. According to the Foundation, it expects to reduce the thickness of the marble to ¼ inch, but further development will be necessary before this will be feasible.

Armour Research reports that the mechanical properties of many sandwich systems were studied in the course of research to establish their adaptability to both interior and exterior applications. In bonding the marble veneer to the core material, for example, the Foundation scientists found that only certain adhesives were workable: some produced unsightly discoloration under accelerated aging conditions; others became too rigid and, thus, would not permit differential expansion; and still others could not be used on vertical surfaces because they were too slow in developing setting properties.

Arabol Unit On Stream

A facility producing 200 adhesives has been put on stream in Delaware, Ohio, by Arabol Mfg. Co., New York, N.Y. The new adhesives plant covers 20,000 square feet in area. The company reports that a 12,000 square foot plant will go on stream this Spring in Portland, Ore.

". . . and try not to stand too long in one spot!"

Corn Develops Starch

A new starch, especially developed for corrugating adhesive, has been developed by the Industrial Division of Corn Products Sales Co., New York, N.Y. Designated Coragum FD, the new corrugating starch is produced by flash drying. This process, the company states, produces starch that is more uniform in particle size, composition and moisture content. The method of drying, in a stream of heated air, is said to eliminate completely any chance of the particles becoming overdried or case hardened due to partial gelatinization.

According to Corn Products the practical benefits of the new starch to the corrugator are: faster dispersion; a more uniform adhesive paste, because the starch particles are more uniform; easier housekeeping, because the starch produces little dust; a heavier bodied adhesive in standard corrugating formulas—viscosity adjustment can be made by increasing the amount of water in the formula; a more uniform board, because complete dispersion eliminates lumps and grit that can cause accumulation on corrugator fingers; glue lines are better; and scrap losses are reduced. Information is available from the company on request.

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Adhesive Program At TAPPI Conference

Adhesives will be the theme of the 12th Coating Conference of the Technical Association of the Pulp and Paper Industry, to be held on May 8 to 10, 1961, at the Statler Hilton Hotel in Buffalo, N.Y. At present the program consists of a panel discussion on Adhesives for Coatings and the presentation of nine papers.

Richard T. Trelfa (Perkins-Goodwin) will serve as moderator of the panel, and the panelists will be Frederick H. Frost (S. D. Warren); Frank M. Kaulakis (Consolidated Water Power & Paper); J. T. Loomer (Continental Can); and William P. Taylor (Champion Paper & Fibre).

The papers scheduled to be presented include:

"The Use of Polyvinyl Alcohol as a Color Coating Adhesive," by George P. Colgan (Air Reduction Chemical);

"Adhesion to Fibrous Materials," by Prof. J. J. Bikerman (M.I.T.);

"Cationic Latex with Controllable Penetration and Set-Off Properties." by E. J. Heiser (Dow Chemical);

"Precast Clay Coating—A New Process and a New Product," by Frank D. Bergstein (Interstate Folding Box);

"Kohler Coater," by John R. Gunning (Abitibi Power & Paper) and F. W. Kohler (Kohler Coating Machinery);

"The Requirements of Starch for Paper Coating," by A. Harsveldt (Nationale Zetmeelindustrie);

"Rheology Modifiers for Trailing Blade Coasters," by James F. Hern (Nopco Chemical);

"Coating Forecast," by Maurice R. Castagne (*Pulp & Paper*);

"Starch Graft Copolymers as Paper Coating Adhesives," by M. L. Cushing (A. E. Staley).

Franklin Research Unit

The Franklin Institute, Philadelphia, Penna., will erect a $2.5 million laboratory adjacent to its main building which will make it possible to increase its personnel and expand its research activities. The Institute serves both private industry and Federal agencies, including the Defense Department, assisting in research and development.

Taiwan Urea Facility

Mobil Chemical Co., a division of Socony Mobil Oil Co., plans to operate a new urea plant in partnership with Chinese Petroleum Corp. through a jointly-held Taiwanese firm. The new unit, to be constructed on Taiwan, will produce 100 million pounds a year.

Potdevin 2R Coater

High speed coating of paper up to 12 inches in width is accomplished with the Model 2R coating machine developed by Potdevin Machine Co., Teterboro, N.J. According to the manufacturer, the machine will accommodate any coating material—adhesives, latex, varnish, resin, etc. It is equipped with a semi-automatic feed mechanism that accepts paper sizes from 2 to 12 inches in width.

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Marmet Insu-Wall System

A new aluminum curtain wall system, said to reduce thermal conduction through metal, has been developed by Marmet Corp., Wausau, Wisc. Designated Insu-wall, the system is reported to have the same structural qualities as uninsulated aluminum curtain walls, and it can be erected just as fast. This insulated framing combines with insulated panels from other manufacturers, the company states.

The insulating material, a melamine plastic, is glued in place with an epoxy resin and then pinned against shearing stresses. It separates exterior and interior metal, so that there is no direct metal-to-metal bond.

Trancoa Urethane Resins

Trancoa Chemical Corp., Reading, Mass., has developed two new applications for urethane coatings. The urethane coatings are being used to preserve both leather and concrete. According to the company, tests indicate that clear urethane sealers keep concrete floors in industrial plants attractive and in good condition three times longer than other types of commercial sealers. The urethane sealers are said to give concrete floors an extra tough, high gloss finish with excellent resistance to water, chemicals, solvents, and abrasion.

Trancoa Chemical also reports that the urethane coatings are increasing the scuff resistance, flexibility, and gloss retention of shoes, luggage, and other leather goods. Cracking resistance is said to be 10 to 12 times higher for patent and side leather treated with urethane coatings than with conventional leather finishes.

Corn Profits Up

Corn Products Co., New York, N.Y., reports a record rise in its profits and sales for 1960. Profits for the year ended December 31 were $38,185,000, equal to $3.48 per share of common stock, up 14 per cent from the 1959 earnings of $33,171,953, or $3.04 a share. The firm's sales in 1960 totaled $691,370,000, a record high, compared with the previous high of $676,377,114 in 1959. According to the company, its international operations had contributed substantially to over-all earnings.

Plastoid Acquires Firm

Plastoid Products Co., Detroit, Mich., has acquired Advance Polymer, Inc., Jersey City, N.J., and its line of two-part polysulfide, polyurethane, and epoxy sealing products. According to the company, Advance Polymer will continue to operate at its present address, as a subsidiary of Plastoid. In addition, Advance Polymer will become a manufacturing subsidiary of the parent company's caulking and glazing products for the Eastern market. Plastoid reports that it will market Advance Polymer products through its nine branches and factories in the United States and Canada.

Reichhold Names Two

Charles S. Stryker has been appointed sales manager, and William F. Turner, director of technical services for the Plastics Division of Reichhold Chemicals, Inc., White Plains, N.Y. Mr. Stryker will be responsible for the sales of resins to the plastics industry and sales of peroxide catalysts to all industries. Mr. Turner will direct all national technical services of the Plastics Division.

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patent review

By MELVIN NORD

Applying Adhesive to Container Rims

U. S. Patent 2,952,239, issued September 13, 1960, to Harry E. Stover and assigned to Anchor Hocking Glass Corp., describes a roller mechanism for applying adhesive to rims of containers. A thin disc then bonded to the rim, provides a leakproof closure over the mouth of the container.

It has been found that by providing grooves in the roller, the adhesive will be deposited in a series of bands or spots on the container rim. With an adhesive of proper viscosity, the edges of the bands will merge, before the cap is applied, and provide a uniform coating of adhesive of greater thickness than with prior methods.

If any bands do not merge with adjoining bands to form a uniform coating, the adhesive in them will be forced over the intermediate portions on application of the closure to provide a uniform coating of adhesive and a very secure bond between the disc and the rim of the container. The grooves also minimize the tendency for the adhesive to pile up in front of the roller during application.

Figure 1 is a perspective view of the invention, showing the adhesive-applying roller. An adhesive-feeding reservoir with a container underneath the roller has its rim in contact with the roller in position for the application of the adhesive formulation to it.

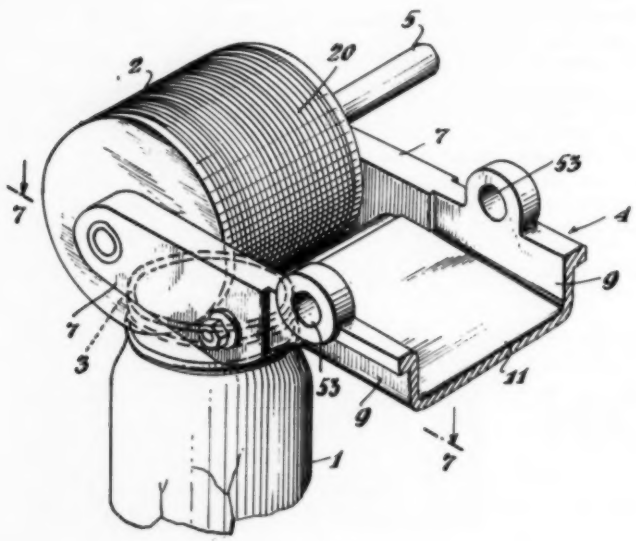

Figure 1

Cement to Wall Board Tape

U. S. Patent 2,957,449, issued October 25, 1960, to Bruce Carmichael, describes an apparatus for applying joint cement to wall board seam tape.

The apparatus consists of an elongated trough having an inlet and outlet end for the tape, a hopper communicating with the trough and receiving a supply of the cementing material, and a means at one end of the trough for metering the amount of cementing material deposited on the tape from the hopper as the tape is pulled outwardly from it. As the tape leaves the trough, it is also creased longitudinally.

Adhesive Tape Mixture

U. S. Patent 2,954,353, issued September 27, 1960, to Donald S. Bruce and Howard L. Heise, assigned to St. Regis Paper Co., discloses an adhesive mixture suitable for application to tape to form a dry non-blocking water remoistenable surface having an enduring quick tack.

The adhesive agent consists of a mixture of three per cent polyvinyl alcohol with at least 75 per cent of desugarized concentrate of waste sulfite liquor. The latter contains lignosulfonic acid calculated on a dry basis, with at least 5 per cent by weight on a dry basis of an inhibitor which prevents migration of the sulfite liquor to the water remoistenable surface, such as dibutyl phthalate.

Hydrated Lime

U. S. Patent 2,957,776, issued October 25, 1960, to Joseph Volk, assigned to National Gypsum Co., describes a method of making an improved temperature-stabilized atmospherically-hydrated dolomitic lime.

The process consists of (1) tube-milling 5 to 75 parts by weight of atmospherically-hydrated dolomitic lime to a particle size of 95 per cent through a 30 mesh screen and 85 per cent through a 200 mesh screen, (2) reducing the particle size of a quantity of atmospherically-hydrated dolomitic lime in a high speed hammer mill to a particle size equal to the particle size of the tube-milled product, and (3) blending the two in a proportion such that the plasticities of the mixture at 72°F. and 30°F. are substantially identical.

Bonding Film

U. S. Patent 2,951,004, issued August 30, 1960, to Albert F. Martin, Warren C. Pagel, and George M. Rambosek, assigned to Minnesota Mining & Manufacturing Co., provides a composite unitary bonding film or sheet material having dissimilar surface layers. The material is particularly adapted for use in providing a structurally strong

bond between a honeycomb core structure and a skin panel.

The composite film of this invention consists of a unitary strip having a thin layer of rubber-based composition or equivalent, and a thin layer of solid filleting epoxy or equivalent resin composition. A scrim-type web material is also included in the composite film, particularly in films to be used in honeycomb core bonding. The solid rubbery layer and solid filleting epoxy layer are firmly united together to form an integral sheet product, and both layers are heat-curable under similar elevated temperature conditions.

Solid epoxy resins for use in this invention are typically produced by the reaction of 2,2-bis-(4-hydroxyphenyl) propane, *i.e.*, Bisphenol A, and epichlorohydrin in alkaline medium.

As shown in Figures 2 and 3, the sheet product (10) is placed with its rubber-based layer (11) after stripping the polyethylene interliner from it, next to previously cleaned and etched aluminum skin panels or face sheets, and with its epoxy composition layer and scrim cloth layer in position for receiving a honeycomb core structure over it. If desired, the skin panels or face sheets may be primed with a coating of solvent-dispersed adhesive priming material or the like.

The bond between the honeycomb structure and the epoxy composition layer, and between the rubber-based layer and the skin panel may be formed as follows: Pressure, *e.g.*, about 25 lbs./in.^{2}, is applied upon the exterior of each skin panel (numeral 14 as illustrated in Figure 3) so as to mate the metal parts and force the lay-up together. Simultaneously the lay-up is heated, *e.g.*, about 4°F. temperature rise per minute from room temperature to

Figure 2

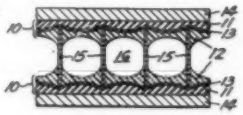

Figure 3

about 350°F., which is held for about two hours for strongest bonds.

In the heating cycle, the epoxy composition layer first fluidizes, passes through the pores of the scrim cloth, and "fillets," as illustrated at 12 in Figure 3. This "filleting" action takes place within about one minute after the epoxy layer is fluidized. Thereafter, on continued increase of temperature, this layer cures to a solid rather brittle thermoset state of high shear strength —but with relatively lower peel-resistance as compared to the rubber-based layer—holding the honeycomb structure in place. Simultaneously, the rubber-based layer is cured during heating, and at the temperature needed for curing the epoxy composition layer, the rubber-based layer becomes essentially completely cured. Thus, the rubber-based layer anchors itself firmly in a peel-resistant manner to the skin panel.

Other Patents of Interest

Subject	Inventor or Assignee	Patent No.	Date
Bonding silicone rubber to metal	Secretary of the Navy	2,957,794	10/25/60
Animal glue adhesive	Union Carbide Corp.	2,958,605	11/1/60
Priming of zinc surfaces	Minnesota Mining & Manufacturing Co.	2,958,611	11/1/60
Resin coatings for glass surfaces	General Aniline & Film Corp.	2,958,614	11/1/60
High temperature Portland cement mortars	Tile Council of America, Inc.	2,959,489	11/8/60
Treating sealing edges of glass parts	Owens-Illinois Glass Co.	2,959,493	11/8/60
Concrete curing compound	Pure Oil Co.	2,960,412	11/15/60

Copies of any patents, including those described here, are available from the Commissioner of Patents, Washington 25, D. C., for 25 cents each. Do not send stamps.

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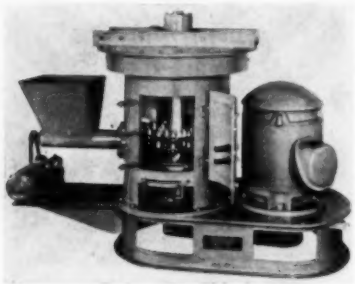
new equipment

Small Capacity Mill

The manufacturer has added to its Pulver-Mill line a small capacity mill for small quantity grinding of soft and medium-hard materials. The new unit is a 15-inch, 25 hp impact mill



said to be capable of producing in the hundreds-of-pounds-an-hour range—up to a ton and a quarter. The small mill offers patented double-impactor grinding; deflector wall construction to bounce partially-ground material back into the grinding zone while further speeding the pulverization process; and adjustable air classification, thus allowing precise end-product selection, the company states. *Sturtevant Mill Co.* **E-288**

Epprecht Viscometer

The Epprecht viscometer has 15 speeds ranging from 5.6 to 352 rpm, and is designed for laboratory and in-line process use. A rotational viscometer, it can be used to measure Newtonian liquids, plastics, pseudo-plastics, dilatant, rheopexic, and thixotropic substances. The unit is capable of giving 15 readings that can be used to produce accurate rheograms and automatically control manufacturing processes, the manufacturer states. In addition, when equipped with a potentiometer, the viscometer can be the sensing elements for recording and an automatic control of valves, timers and switches. Shear rates of the unit are from 1 to 2000 sec and the shearing force varies from 2 to 200,000 dynes/cm^2. The viscosity range is from 0.2 to 10^7 cp. *J. W. Fecker Division, American Optical Co.* **E-289**

Melting Point Apparatus

The Uni-Melt capillary melting point apparatus is said to provide a high degree of reproducibility of results with the accuracy required by U.S.P. methods. It is self-contained in a sturdy unit requiring small bench area. According to the manufacturer, the unit's features include provision for observation of five samples simultaneously in a well lighted and unobstructed field of viewing; elimination of glassware by utilizing a standard glass beaker for silicone fluid bath; inertia-free electric heating; rapid cooling; adjustable stirrer speed and a unique built-in capillary vibrator. The bath assembly can be readily removed for replacing the bath liquid. *Arthur H. Thomas Co.* **E-290**

Tear Tape Unit

The Inta-Roto-Kampf combination slitting and spooling machine for production of tear tape is designed to accommodate a maximum web width of 12 inches and consists of an unwind and shear type slitting head. The spooling machine accommodates 60 spools and is driven through a line shaft from the slitter over a potentiometer control. Automatic and accurate rewind tension is provided by the latter. Model EK-7 is said to be of sturdy design and precision built for maximum production. *Inta-Roto Machine Co., Inc.* **E-291**

Tape Applying Machines

A new line of multi-purpose tape applying and combining machines, these units combine and tape together boxes, cartons, and packages of varied sizes and shapes. The equipment incorporates Scotch brand flat surface applicator taping heads. Objects are combined and tape is applied on one or both sides of the objects in one operation. According to the manufacturer, the machines can be automatically, hopper or manually fed and can combine and tape up to 150 boxes per minute. They can also be used to index and register printed tape at the same production rates. *Lened Mfg. Co., Inc.* **E-292**

Spray Equipment

The Chemtronic spray equipment and process is reported to permit the application of coatings with high solids, resulting in greater film build-up with less sags, orange peel, and fewer spray passes. The process utilizes a hydrocarbon compound called Chemsine, which is heated and vaporized into a dry gas 2½ times heavier than air. According to the manufacturer, very thin materials can be atomized into much finer particles at lower pressures to give a more uniform coating. In addition, high viscosity materials can be sprayed giving up to four mils dry film thickness on verti-

cal surfaces without sagging in one spray pass. The manufacturer states that solvent balances are less sensitive to changes in temperature and humidity due to the fact that a very small part of the solvent is evaporated in the actual spraying process. A wide range of fluid nozzles, air caps, and needles are available, in addition to pressure feed, suction feed, gravity feed, and automatic spray guns. *John J. Fannon Products Co.* **E-293**

Temperature Measurer

The Thermi-Tem is a new instrument said to quickly and accurately measure the temperature of liquids, penetrable masses and surfaces. According to the manufacturer, the unit will indicate the ultimate temperature in three to ten seconds with an accuracy of 2 per cent. The temperature scales are linear and are available as low as −50°F. or as high as 500°F. The indicating meter has a shock protected mounting in an anodized aluminum case. The probe has a six-foot lead and can either be straight or have a 90° angle. *Testing Machines, Inc.* **E-294**

High-Speed Disperser

A stationary tank type disperser, the units come in various sizes ranging from 5 to 3000 gallons. They are said to feature high speed dispersion type impeller of either sawtooth disc

type or with closed design multiple action millhead for producing ultimate grinds or dispersions. The impeller and shaft are of stainless steel and operate at speeds up to 5000 rpm. According to the manufacturer, tremendous impact and shear are developed which results in mixing and dispersing most paste type products in considerably less time than in other types of stationary tank mixers. The tanks are provided either plain or jacketed, with several optional type outlet gates, and with legs to raise the gate to any required height above the floor. *Charles Ross & Son Co.* **E-295**

Intermediate Web Guide

Model 111-V is a new intermediate point web guide for processing light gauge materials. Its vacuum operated guide is said to maintain side register on a 12-inch maximum width web with an accuracy up to +.005 inch. According to the manufacturer, any deviation in web alignment is instantly perceived by the unit's special sensing head, transmitted by a signalling mechanism to its actuator, which physically repositions the guide rolls. This change in guide roll position instantly restores the web to its correct path. Model 111-V is available as a package unit with components made to any web processing operation. *Stanford Engineering Co.* **E-296**

Airless Spray Gun

Designated Versa-Gun, this spray gun is designed for use with airless spray coating systems, and features an internal design that increases turbulence ahead of the nozzle. The

manufacturer states that the spray pattern produced by the Versa-Gun is accurately controlled and has correctly feathered edges for the proper overlap of gun passes. The increased internal turbulence is said to provide more even atomization. In addition, the gun circulates coating materials right up to its nozzle to prevent spitting. *Nordson Corp.* **E-297**

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book reviews

Organic Coating Technology. ***By Henry Fleming Payne. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N.Y. 6 x 9 in. 724 pp. $17.50.***

A companion volume to "Oils, Resins, Varnishes and Polymers" by the same author, this book offers an outline of the manufacture, application, general chemistry and physical properties of pigments and pigmented coatings made by the paint industry.

In spite of their diversity, paint coatings can be divided into two general groups: architectural coatings and industrial coatings. The former includes paints, varnishes and enamels for the inside and outside of homes and factories. Industrial coatings, on the other hand, are used on just about every type of material and product imaginable. Not only do they cover and protect automobiles and ships we ride in, but they make possible the beer cans we drink from and the new greaseless baking pans that surrender a loaf or a cake without a struggle.

Some idea of the importance of this industry can be gathered, the author points out, by the fact that there are 1400 manufacturers of organic coatings in the United States and that the annual value of their products has passed the billion dollar point.

Professor Payne, who is presently responsible for organic coating research at the University of Florida, has broken down this study into 12 subdivisions: fundamental of pigmented coatings, white pigments, extender pigments, inorganic color pigments, organic color pigments, black pigments, metal pigments and metallic stearates, formulation and production principles, surface preparation and application methods, architectural paints, industrial finishes, corrosion and chemical-resistant paint systems.

Synthetic and Protein Adhesives for Paper Coating. ***(TAPPI Monograph Series No. 22). Published by the Technical Association of the Pulp and Paper Industry, 360 Lexington Ave., New York 17, N.Y. 6 x 9 in. 272 pp. $3.00.***

This book is a revised edition of Monograph No. 9 originally published in 1952. As in the original publication, the discussion of the subject is highly technical and the material intended for the reasonably advanced student or practitioner.

Since adhesives are the major ingredients of various coating formulations used today, the more technicians and researchers know about this important component the better prepared they are to meet the needs of the coated paper and board industries. The market for coatings, incidentally, is constantly increasing as more and more manufacturers come to realize that coatings are often the key to that attractive package which can make the sale for them.

The book covers the use of adhesive materials such as styrene-butadiene latices, acrylic binders, casein, isolated soy proteins and animal glue. It is interesting to note that until the casein formulations helped to displace them, animal glues were the most important, and for a while the only adhesives used in bonding coated paper.

To provide some background in adhesive theory for the coatings technician, S. Chandrasekaran and H. Mark, Polymer Research Institute, Polytechnic Institute of Brooklyn, have written an interesting survey chapter entitled "A Few Principles of Adhesion."

International Symposium on Plastics Testing and Standardization. ***(ASTM Special Technical Publication No. 247). Published by the American Society for Testing Materials. 1916 Race St., Philadelphia 3, Penna. 5¾ x 9¼ in. 269 pp. $6.00; $4.80 (members).***

Four symposium sessions of a two-day international meeting on plastics testing and standardization are recorded in this volume. Of the 24 papers given, 18 were delivered by delegates of foreign nations and the information they provided is expected to vastly advance the cause of international standardization.

The first session of the symposium, which was held in Philadelphia, October 30-31, 1958, was devoted to talks on how national standards are achieved in Belgium, Czechoslovakia, France, Germany, Hungary, Poland, Rumania, Sweden, The Netherlands, the United Kingdom, the USA and the USSR.

Engineering properties of plastics were covered at the second session. These talks, as well as those in the following session on the thermal properties of plastics, not only covered current techniques but went on to examine some that might be applicable to standardization work in the next few years.

The final session of the symposium dealt with work on molecular characterization. Some of the topics discussed in the formal papers published here are the accurate determination of molecular weights of macromolecules and the use of infrared spectroscopy and x-ray diffraction scattering in the characterization of polymer structure.

Handbook of Accident Prevention. ***Published by the National Safety Council, 425 North Michigan Avenue, Chicago 11, Ill. 5¾ x 9 in. 93 pp. $2.20.***

This handy little manual covers in outline form all aspects of plant safety procedures. Common hazards and what to do about them are dealt with in ten chapters.

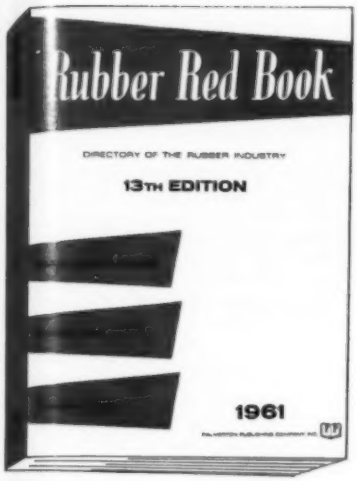
Of special interest to adhesives formulators and users is the material on solvent hazards, spraying operations, handling of corrosive materials and protection against dermatitis. Commenting on the latter, the editors of this handbook stress the fact that "simple soap and water cleanliness is enough to prevent most industrial dermatitis. It is most important that this fact be impressed upon the work force."

The book includes a list of safety consulting services and recommended publications of these organizations.

Trade Literature

Cooker-Extruder. Advance Specification Sheet No. 224 describes the workings of a continuous pressure cooker-extruder which is said to be extremely efficient and economical. The unit cooks or gelatinizes starches and cereal grains and creates an expanded product by forcing the cooked material through a relatively thin die. The heat necessary for gelatinization is obtained by introducing steam on a continuous cooker. This method reduces the horsepower required by the extruder, thus reducing the cost of the operation. Additional advantages of this method are said to be more complete cooking, reduced drying requirements, variable cooking temperatures and high tolerance for fat. The release provides a diagram of the extruder and approximate over-all dimensions. *Sprout, Waldron & Co.*
L-336

Pressure-Sensitive Tape Applications. This illustrated, 25-page manual (No. P-GGAMR2), contains a review of pressure-sensitive tape applications in the graphic arts industry. It describes the growing number of taping applications for the letterpress, lithography, and rotogravure printing fields, ranging from opaquing negatives to adhering shells to the inside of centrifugal casting drums. Containing over 100 photographs, the manual also illustrates taping applications in the packaging, plant maintenance, and paper and film fields, and shows some of the equipment designed for manual, semi-automatic and automatic taping. This ranges



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For the convenience of users, the names and addresses of suppliers, formerly included at the end of each individual section, have now been consolidated into one complete alphabetical list. Sales and export offices, where furnished, are shown in a number of cases. Telephone numbers, too, have been included for convenience.

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Trade Literature (Cont'd.)

from the desk dispenser to machines capable of split-second applications. *Minnesota Mining & Manufacturing Co.* L-337

Chemical Resistant Polyesters. This report describes how three polyester resins—bisphenol-A, isophthalic, and general-purpose—withstood a six-month immersion in various corrosive aqueous solutions at elevated temperatures. It is aimed at those in the chemical, paper, petroleum, metals, textile, and other industrial fields, where these materials are used in fabricating chemical-resistant equipment. The report is made up in two sections: a 12-page detailed description of the test techniques and results of a three-month immersion period, and a four-page supplement which includes tables and curves of the behavior of the three types of resins in the six-month period. *Atlas Powder Co.* L-338

Silicones in Aircraft and Missiles. "Silicones Solve Space Age Problems" is an eight-page reference which describes some of the applications for silicones in military and commercial aircraft, missiles, and ground support equipment. More than 25 of these applications are detailed and illustrated. They range through all types of air vehicles, from the Fairchild F-27 to the B-58 Hustler and from the Redstone to the Jupiter missiles. The bulletin also covers such silicone products as fluids, rubber, potting materials, sealants, and protective coatings, and outlines why silicones have become such basic materials. *Dow Corning Corp.* L-339

Contact Cements. Several Angier hot and cold bonding contact cements applicable for curtain wall, office and sanitary partitions, desk and counter tops and other industrial uses are described in this four-page booklet. The booklet contains instructions on preparation of the facings and core of materials to be bonded, and on application of the adhesive. It also provides data on bond strength and offers a table giving physical properties of hot and cold contact cements used for honeycomb panels and rigid laminating. *Interchemical Corp.* L-340

High Resistant Metal Primer. Technical Bulletin M-24 describes a new heavy-duty epoxy type primer containing lead silico chromate, iron oxide, and leafing type pigments, formulated to provide good bonding qualities and over-all high chemical resistance. The bulletin gives physical properties, application procedures and uses. *Wisconsin Protective Coating Corp.* L-341

Standards for Polysulfide Sealants. Entitled "Proposed Specification for Sealing Compounds for the Building Trade (Polysulfide Base or Equivalent)," the specification represents the combined efforts of two industry groups, the Building Trade Specifications Committee and the Rubber & Plastic Adhesives & Sealant Manufacturers Council. The specification covers performance properties of polysulfide base sealing compounds, or equivalent, including curing agents, for use in sealing, caulking, or glazing applications in buildings. The specification covers requirements, handling properties, and methods of testing. *Thiokol Chemical Corp.* L-342

Urethane Wood Finishes. This four-page technical bulletin (No. 3-60) describes two resin systems which are offered as clear coatings for producing durable finishes said to enhance the beauty and character of wood. Bostik Series 300 and 400 coatings are based upon polyurethane resins which set by a chemical reaction. They are supplied as two-component systems, the two components being mixed prior to use. The wood finishes are said to be weather, abrasion, and chemical resistant. The bulletin describes materials and basic techniques for mixing and application. *B. B. Chemical Co.* L-343

Maraglas Transparent Resin. Methods of producing flexible as well as rigid castings from Maraglas Transparent Epoxy Resin No. 655 are outlined in this two-page bulletin, together with working instructions. Sections of the bulletin summarize characteristics, expound proper resin and hardener mixtures and curing methods for rigid, high-impact and flexible Maraglas castings, give general directions for mold preparation and mold release, and show quantities and prices for resin plus hardener in pre-measured units or graduated amounts. *Marblette Corporation.* L-344

Bakelite Vinyl Resins. This technical booklet on vinyl solution coating formulation techniques provides the coatings formulator with basic information on the general properties and uses of vinyl solution resin-based finishes. It contains information on formulations and preparation of clear as well as pigmented coatings, and application methods. The 36-page booklet includes two tables listing the pigments and dyes suitable for tinting vinyl finishes. It is completely illustrated and shows applications ranging from sulfuric acid processing equipment to vinyl-coated book binding. The title is "Bakelite Vinyl Resins for Solution Coatings." *Union Carbide Plastics Co.* L-345

Adhesives, Coatings, and Sealants. Three folders, "Stabond Adhesives," "Stabond Coatings," and "Stabond Sealants," consist of colorful charts illustrating applications, specifications and properties in easy-to-read form. "Stabond Adhesives" covers the company's Buna-N, epoxy, natural rubber, polyvinyl, and neoprene base series. The folder on sealants covers polyester, synthetic, and epoxy base series; and the coatings material deals with the Buna-N, Hypalon, and neoprene base series. *American Latex Products Corp.* L-346

Foil Paper and Foil Board Standards. A 16-page booklet entitled "Aluminum Foil Paper and Foil Board Standards," this literature lists standards which have been adopted by the Laminated Foil Manufacturers' Association. The Association recommends the standards as a guide, and to supply users with basic information relative to the product and accepted trade customs. Included in the booklet are a page of conversion formulas and a glossary of trade terms. *Laminated Foil Manufacturers' Association.* L-347

Isochembond Data Sheet. Described in this two-page data sheet are Isochembonds 301, 303, 521, 811, 321 and No Mix. According to the bulletin, Isochembonds are flexible adhesives that may be catalyzed at room temperature or rapid cured with heat. The materials are recommended for use in bonding metal-to-metal, leather, ceramic, fabric, wood, most plastics, and rubber. Included on the data sheet is a mixing chart and a list of some typical properties of cured resin. *Isochem Resins Co.* L-348

Ice-Proof Adhesive. Bulletin M60-6 describes a casein ice-proof adhesive for use by brewers and bottlers. The two-page sheet lists advantages of the adhesive such as tack, water resistancy, freeze-thaw properties, and machine stability. Also presented are results of an eight-hour test run under practical conditions. *Manhattan Adhesives Corp.* L-349

Refinishing Supplies. The six-page brochure, called "Products for the Refinishing Industry," describes and illustrates outstanding features of several portable and wall-mount maskers, masking tapes, masking paper, wash 'n wipe cloths, tack rags, a pre-paint cleaner, steel wool pads, abrasives, and body repair tape. *Permacel.* L-350

FOR MORE INFORMATION on the literature items described here, use the Reader's Service Coupon in this issue.

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a|a CLASSIFIED ADVERTISING

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No Comment

One of the most forceful writers on the art of merchandising today is Bernice Fitz-Gibbon, the lady who gave New York's R. H. Macy's department store the "It's Smart to be Thrifty" slogan. Miss Fitz-Gibbon speaks her mind in a column called just that: Bernice Fitz-Gibbon Speaks Her Mind.

The directness of Miss Fitz-Gibbon's approach may be somewhat startling for the uninitiated. For example, some time ago in discussing the usual dreary approach to selling children's shoes, she pointed out how sales could best be multiplied. "In the first place," she advised, "you should scare the bejabers out of the parents. Tell them their children's feet right this minute are being crippled by too short shoes. Ten to one—you'd be dead right."

Miss Fitz-Gibbon goes on to describe a children's shoe ad in which people and pachyderms are compared and the doleful news conveyed that only one out of every 20 humans has perfect feet when he grows up. "So you must create a reign of terror that will strike fear into the hearts of the parents—and dollars into your tills."

If you're too prissy to take this forthright advice straight, Miss Fitz-Gibbon ends her heady column with the following chaser: "Scare stuff is good for any product—if the scaring is justified. And in the case of children's shoes—it is."

What Flavor, Please?

Our GNP now includes "flavored" toothbrushes. Plastic handles of the brushes are colored and scented to give the impression of chocolate, vanilla, orange, lemon, lime or strawberry flavors. The brushes are hygienically sound and made according to standards of the American Dental Association. Colored caps of the brush packages are scented to match the brush.

Shades of Midas

Does your touch rust? Eastman Kodak Co. researchers report that some people produce more rust by touching metal than do others. If you're corrosive, the experts suggest that you work in a cool place, drink more water, wash your hands more often and cut down on your salt intake. Keeping your hands off things helps too.

Business Directory

Over 2000 national associations are listed in a recent U.S. Department of Commerce publication, "Directory of National Associations of Businessmen: 1960." Of those listed about 50 per cent are organizations of manufacturing companies and the rest are associations of companies engaged in finance, construction, transportation, retail trade, service industries, etc. The address, number of members, size of the staff, name and title of the chief executive and the year of organization are given for each association. A "Key Work Index" makes it possible to locate all associations in a given field.

Copies of the directory are available from the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C. The price is 50¢.

Pity the Peddler

In Montreal, a judge found before his bench a peddler who had been peddling signs in violation of a local anti-peddling ordinance. The man offered as his defense the fact that he had actually been contributing to the cause of law and order by peddling signs which read "No Peddling Allowed." The judge was unimpressed. He fined the peddler $10 and costs, and advised him to peddle his "no peddling" signs some place where peddling was perfectly legal.

Age of Analysis

Americans continue to be fascinated with the possibilities offered by various schools of analysis for "controlling" environment by adjusting to it. We heard recently of a company that decided to set up its executive staff in accordance with strict psychological principles. Presumably acting on the advice of an industrial psychiatrist, they've made arrangements for every dominant, aggressive chief to have a meek assistant.

Towards Flexible Finances

Charles Goodyear, he of rubber fame, was reported to have been so pleased with his vulcanization process that he wore rubber hats, ties and vests, and thought that even banknotes should be made of rubber.